

#### Review

## A Preliminary Discussion on the Digital Transformation of Hospital Financial Management from the Perspective of Business-Finance Integration

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#### **Abstract**

With the rapid advancement of information technology, traditional models of hospital financial management have increasingly struggled to meet the demands of modern healthcare services. This paper takes "business–finance integration" as its entry point to explore how digital technologies can be leveraged to upgrade hospital financial management. Addressing the challenges encountered during digital transformation — such as data silos, talent shortages, and mounting cost pressures — we propose concrete strategies including the development of an integrated system, the reinforcement of business–finance collaboration mechanisms, and the enhancement of talent cultivation. By examining a case study of a tertiary-level hospital, we validate both the feasibility and effectiveness of the digital transformation initiative. Our goal is to offer hospital administrators practical insights — from conceptualization through implementation — that facilitate the shift of financial management from traditional accounting to intelligent decision-making, thereby enabling hospitals to achieve efficient and sustainable operational governance in the digital era.

Keywords: Business-finance integration; hospital financial management; digital transformation

#### 1 Introduction

In the context of the digital age, demand for medical services is growing steadily, and as a key public service provider, a hospital's operational management complexity and requirements for precision continue to intensify. For a long time, however, many hospitals have maintained a siloed approach, with business units and finance departments operating independently. Common issues such as data isolation and cumbersome workflows have led to resource waste and delayed decision-making. Under these circumstances, the concept of business—finance integration has garnered increasing attention: by fostering deep collaboration between clinical operations and financial management, information can flow seamlessly and operational efficiency can be enhanced. Con-

currently, digital transformation offers the technological foundation necessary to realize this concept. Tools such as automated accounting systems and intelligent analytics can significantly improve management performance. Therefore, within the framework of business—finance integration, systematically advancing the digital transformation of hospital financial management represents a core challenge for hospitals seeking to modernize their operations.

# 2 The Relationship between Business–Finance Integration and Hospital Financial Management Digital Transformation

## 2.1 Concept and Connotation of Business-Finance Integration

Business-finance integration refers to the close alignment of operational management with financial management, breaking down traditional barriers to achieve smooth information exchange and coordinated operations. At its core, it involves embedding financial

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management principles and methodologies throughout all stages of business activities, enabling finance professionals to gain in-depth understanding of operational realities and provide expert financial support for business decisions. Conversely, operational staff develop a basic financial mindset, ensuring that cost—benefit considerations are fully integrated into business initiatives and fostering mutual interaction between business and finance.

Under a business—finance integration model, the role of the finance department shifts from mere accounting and oversight to that of a strategic partner. Both business and finance collaboratively engage in functions such as strategic planning, budget preparation, cost control, and performance evaluation. For example, in the development of a new clinical department, financial staff can participate early on to assess the project's return on investment and funding requirements from a financial perspective [1], thereby informing feasibility decisions; during project execution, operational teams work closely with finance to manage costs effectively and enhance economic returns.

## 2.2 Connotation of Digital Transformation in Hospital Financial Management

The digital transformation of hospital financial management harnesses cutting-edge information technologies to comprehensively and systematically innovate processes, methods, and models. Its goal is to drive automation, intelligence, and precision in financial management — to boost efficiency and quality, reduce management costs, and furnish hospital leaders with accurate, timely, and comprehensive data for strategic decision-making.

Key areas of transformation include:

- Accounting Automation: Implementing advanced financial software to automate ledger entries, report generation, and other routine tasks, thereby reducing manual labor and improving accuracy and speed.
- Unified Data Platform: Establishing a centralized data repository that aggregates financial information from disparate hospital systems, enabling consistent data storage and sharing and laying a solid foundation for analysis.
- Intelligent Analytics: Leveraging big data and artificial intelligence to mine and analyze financial datasets, uncovering patterns and trends that inform decision-making.
  - Process Optimization: Reengineering existing

workflows to standardize and streamline processes, elevating overall operational efficiency.

## 2.3 Interdependence of Business-Finance Integration and Digital Transformation

Business—finance integration and the digital transformation of hospital financial management are tightly interwoven and mutually reinforcing. The former infuses the latter with conceptual guidance and strategic direction, making it the driving force behind transformation efforts [2]. Deep integration between business operations and finance breaks down data silos and enables comprehensive data consolidation and sharing — an essential prerequisite for digitalization. Moreover, the demand for precision and intelligence inherent in business—finance integration compels hospitals to accelerate their digital transformation initiatives in order to meet evolving business needs.

Conversely, digital transformation supplies the technological underpinnings and practical means to achieve business—finance integration. By automating and intelligentizing both operational and financial workflows, hospitals can enhance collaboration efficacy. For instance, IoT-enabled real-time monitoring of medical equipment can feed usage and maintenance cost data directly into the finance system, informing procurement and depreciation decisions; similarly, big data analysis of patient care and billing information can guide departmental management and cost control strategies, fostering deeper integration of business and finance.

## **3 Significance of Digital Transformation in Hospital Financial Management**

#### 3.1 Enhancing Financial Management Efficiency

Under traditional models, financial data processing in hospitals relies heavily on manual operations, which are time-consuming and error-prone. For example, expense reimbursement often involves paper forms, multiple approval layers, and manual ledger entries — procedures that are both slow and susceptible to lost documents or approval delays. With digital transformation, electronic reimbursement systems enable end-to-end digital processing [3]. Staff can submit claims via mobile devices or computers; the system performs initial checks automatically, leaving finance personnel to handle only exceptions. This streamlines the reimbursement cycle

and significantly boosts efficiency. Likewise, financial software automates accounting tasks and report generation, markedly reducing manual errors and enhancing data accuracy.

#### 3.2 Optimizing Resource Allocation

Hospitals are complex organizations comprising numerous departments and units; efficient resource allocation is critical to operational effectiveness and service quality. Digital financial management provides real-time monitoring and analysis of resource usage and returns, enabling data-driven redistribution. In equipment procurement, big data analytics can assess utilization rates, maintenance costs, and patient demand to determine appropriate models and quantities — avoiding both shortages and idle assets. In human resource management, workload and performance metrics can guide staffing and scheduling. By dynamically adjusting workforce deployment based on patient volumes and service needs, hospitals ensure optimal staffing levels and maximize productivity.

#### 3.3 Strengthening Decision-Support Capabilities

Accurate financial data and robust analytical insights are pivotal for hospital leadership to make informed decisions. Digital transformation facilitates the construction of a comprehensive financial data warehouse, integrating information from all operational systems. Big data and artificial intelligence tools then extract actionable intelligence, supporting strategic planning, budget management, and cost control [4].

- Strategic Planning: By analyzing historical financial performance in conjunction with market trends, executives can gauge profitability and growth potential, setting realistic development targets.
- Budget Preparation: Predictive analytics forecast departmental service demands and resource consumption, enhancing budget precision and alignment.
- Cost Control: Real-time cost monitoring identifies anomalies promptly, enabling corrective measures such as renegotiating supplier contracts or optimizing procurement processes to contain expenses.

#### 3.4 Enhancing Risk Management

Hospitals face a spectrum of challenges, including financial, operational, and compliance risks. Digital financial management supports the establishment of comprehensive risk-warning mechanisms that continuously monitor and analyze both financial and operational data to detect potential risks early [5].

- Financial Risk Prevention: Ratios such as debt-toasset and current ratios can be calculated and monitored automatically, swiftly flagging financial distress and prompting adjustments to financing structures or asset allocation.
- Operational Risk Management: Analysis of quality metrics and patient satisfaction data can reveal service shortcomings, driving targeted improvements such as staff training or process reengineering to elevate care standards.
- Compliance Oversight: Real-time auditing of billing data and service records helps ensure adherence to laws, regulations, and ethical guidelines, preventing over-treatment or improper charges and safeguarding institutional reputation and legality.

## 4 Challenges in the Digital Transformation of Hospital Financial Management

#### 4.1 Data Silos

Hospitals often operate multiple specialized systems (e.g., Hospital Information System, materials management system, human resources management system), each developed by different vendors with disparate data standards and interfaces. This fragmentation impedes data sharing and integration, forcing finance teams to extract and manually consolidate data from multiple sources — a process that is both inefficient and error-prone [6]. Additionally, asynchronous data updates can skew financial reports; for instance, discrepancies between inventory levels in the materials system and the finance system can lead to inaccurate cost accounting.

#### **4.2 Talent Shortages**

Successful digital transformation demands professionals who are adept in both finance and information technology. Currently, finance personnel in many hospitals lack sufficient IT skills and familiarity with new digital tools. Without mastery of big data analytics or AI platforms, they struggle to extract value from large datasets, limiting their ability to underpin strategic decisions. At the same time, operational staff often lack financial awareness, focusing solely on clinical indicators while overlooking cost-benefit considerations, which can undermine transformation outcomes.

## 4.3 High System Construction and Maintenance Costs

Deploying a comprehensive digital financial management system requires substantial investment in hardware, software, network infrastructure, and training. Procuring high-performance servers, specialized software licenses, and security measures entails significant capital outlay. Furthermore, ongoing maintenance and upgrades — to keep pace with evolving technologies and business requirements — demand continuous funding and specialized personnel, imposing a heavy financial burden on resource-constrained hospitals.

#### 4.4 Security and Privacy Concerns

Digital transformation exposes sensitive information — such as patient identities, billing records, and institutional financial data — to heightened risks of leakage or tampering [7]. Security incidents can inflict financial losses, erode patient trust, and damage hospital reputations. Thus, hospitals must rigorously comply with data-protection regulations, implement robust cybersecurity measures, and continuously update protocols to guard against increasingly sophisticated cyber threats, ensuring the confidentiality, integrity, and availability of critical data.

# 5 Implementation Pathways for the Digital Transformation of Hospital Financial Management under the Lens of Business–Finance Integration

#### 5.1 Building an Integrated Information System

#### 5.1.1 Standardizing Data Definitions

Hospitals must establish unified data standards and coding schemes to ensure consistency and accuracy across all operational systems. For example, standardize codes for medical procedures, pharmaceuticals and consumables, departments, and personnel. A unified procedure code facilitates the finance department's classification and accounting of revenue by department; consistent drug and consumables codes enable refined management of procurement, inventory, and cost accounting; standardized department and personnel codes support performance evaluation at both organizational and individual levels. Hospitals should also develop a comprehensive data dictionary that specifies definitions, formats, and valid value ranges for each data element, forming a solid

foundation for data exchange. Furthermore, data standards must be governed and periodically reviewed and updated to keep pace with evolving hospital needs [8].

#### 5.1.2 Integrating Business and Financial Systems

Establish a unified data platform that deeply integrates the hospital information system (HIS), materials management system, human resources management system, and other business applications with the financial system. This enables real-time data sharing and interaction between operational and financial modules. Business transactions flow automatically into the financial system, where they drive accounting entries and financial analyses, thereby enhancing both efficiency and precision. For instance, procurement orders and goods-receipt notes from the materials management system are transmitted instantly to the financial system, allowing finance staff to calculate accounts payable and schedule payments immediately. Likewise, patient encounter and billing details from the HIS synchronize in real time, enabling prompt revenue recognition. Crucially, financial analyses — such as departmental cost reports — can be fed back to operational units, empowering them to refine cost control and management.

#### 5.1.3 Adopting Advanced Information Technologies

Leverage frontier technologies such as big data analytics and artificial intelligence (AI) to extract deep insights from financial and operational data, empowering strategic decision-making. For example, big data techniques can analyze patient visit patterns and expense data to uncover demand trends and consumption behaviors, guiding service optimization and departmental planning. Insights on peak visitation times, department preferences, and disease prevalence assist in scheduling outpatient clinics and allocating physician resources to maximize patient satisfaction. Analysis of cost components and payment methods informs the design of fee schedules and payment workflows, improving billing efficiency.

AI-driven models can further enhance financial forecasting and risk surveillance. Predictive models of revenue, cost, and profit support budget preparation and strategic planning, while risk-alert algorithms continuously monitor financial and operational indicators to detect anomalies early and trigger mitigation actions [9].

## **5.2 Strengthening Business-Finance Collaboration Mechanisms**

## 5.2.1 Establishing Cross-Departmental Communication Channels

Create structured communication forums to foster

collaboration between financial and operational teams. Regular business–finance joint meetings should focus on strategic planning, budget formulation, and cost control. In these sessions, the finance department presents financial status updates and budget execution progress, while operational units share business developments and challenges. Together, participants devise data-driven strategies and solutions. To sustain interaction, implement ongoing channels such as messaging groups or email lists, ensuring timely exchanges: finance staff can promptly seek operational insights when encountering anomalies, and business teams can receive real-time financial guidance during project execution. Such coordination breaks down information barriers, improves workflow efficiency, and underpins sound decision-making.

## 5.2.2 Implementing Comprehensive Budget Management

Integrate budget management across all business processes to align operational plans with financial objectives, ensuring optimal resource allocation and control. When drafting departmental business plans, operational leaders must incorporate financial considerations and collaborate with finance to set revenue, volume, cost, and profit targets. Conversely, finance personnel reviewing budgets should thoroughly understand operational contexts to validate feasibility [10]. They must critically assess assumptions, benchmark targets, and completeness of proposals, and negotiate adjustments with operational managers to refine budgets.

#### 5.2.3 Conducting Joint Business-Finance Training

Organize integrated training programs for both finance and business personnel to build shared understanding and capabilities in business—finance integration. Courses should cover financial management principles, operational workflows, and information technologies. For finance staff, modules on hospital workflows, clinical service lines, and cost-control methodologies help align financial support with operational realities [11]. For operational staff, training in financial fundamentals — such as interpreting financial statements and applying cost-benefit analysis — raises awareness of financial implications during service delivery and project planning.

#### 5.3 Developing Cross-Functional Talent

#### 5.3.1 Crafting a Talent Development Plan

Design a comprehensive training roadmap to upskill both finance and operational teams. Finance professionals should receive instruction in digital competencies — including big data analytics, financial software operation, and cybersecurity — so they can harness digital tools for management and analysis. Operational staff should undertake financial management training covering core principles, cost-control techniques, and budgetary processes, instilling a mindset that balances clinical and financial priorities [12]. Encourage participation in relevant professional certifications to enhance expertise and interdisciplinary collaboration.

#### 5.3.2 Establishing Incentive Mechanisms

Implement reward systems to motivate staff engagement in digital transformation efforts. Award recognitions or financial bonuses to individuals or teams demonstrating excellence in system implementation, data analytics, or business–finance innovation [13]. Additionally, link transformation achievements to career progression — such as promotions or salary adjustments — to reinforce the personal and professional benefits of participating in the hospital's digital journey.

#### 5.3.3 Recruiting External Expertise

To meet the demands of digital transformation, recruit external candidates possessing both financial acumen and IT proficiency. Evaluate candidates on their academic background, industry experience, and practical skills to ensure alignment with the hospital's strategic objectives. Provide an enabling environment — with clear career pathways, access to resources, and collaborative cultures — to integrate new hires effectively and leverage their expertise in driving transformation [14].

#### 5.4 Optimizing Financial Workflows

#### 5.4.1 Process Reengineering

Conduct thorough audits of existing financial workflows to identify and eliminate redundant steps. For instance, traditional multi-level approval chains for expense reimbursement can be streamlined: authorize senior managers to approve low-value claims automatically or implement online auto-approval rules to expedite processing. In cost accounting, shift from periodic batch processing to real-time costing methods — such as activity-based costing and cost-driver analysis — to detect deviations promptly and enact corrective measures.

#### 5.4.2 Promoting End-to-End Electronic Processes

Deploy technology to digitize all financial operations, enabling staff to submit expense claims, leave requests, and other transactions via mobile or web portals. An internal mobile-office platform can allow employees to upload receipts and supporting documents; once approved, the system auto-generates journal entries, completing the reimbursement cycle. Promote the

widespread adoption of electronic invoicing to reduce reliance on paper invoices, lower handling costs, and enhance accuracy [15]. Partner with vendors to support e-invoices and implement centralized invoice management for storage and retrieval.

#### 5.4.3 Establishing Workflow Monitoring Mechanisms

Implement real-time oversight of financial processes through defined performance indicators — such as processing time, approval rates, and exception frequency. Automated alerts can prompt stakeholders when tasks exceed defined thresholds, while periodic reviews identify throughput bottlenecks and quality issues. Based on these insights, continuously refine workflows to align with evolving organizational needs and uphold high standards of efficiency and accuracy.

#### 5.5 Strengthening Data Security Management

#### 5.5.1 Enhancing Policy Frameworks

Develop comprehensive data security policies that clearly delineate roles, responsibilities, and procedures. Enforce granular access controls to ensure that only authorized personnel can view or modify sensitive data. A role-based permission system should grant finance staff access solely to financial records, while operational users see only relevant clinical data. Establish robust backup and recovery protocols, scheduling regular data backups to secure off-site locations; this ensures rapid restoration of financial data in the event of loss or corruption [16].

#### 5.5.2 Deploying Technical Safeguards

Utilize advanced security technologies — such as firewalls, intrusion detection systems, and end-to-end data encryption — to protect hospital networks and information assets. Firewalls block unauthorized traffic; intrusion detection monitors for and alerts on suspicious activities; encryption secures data both in transit and at rest. Regularly conduct vulnerability assessments and penetration tests to identify and remediate system weaknesses. Maintain detailed audit logs to enable forensic analysis and compliance reporting.

#### 5.5.3 Delivering Security Awareness Training

Implement ongoing security education programs to raise staff awareness of cyber risks and best practices. Organize workshops and simulations focused on common attack vectors — such as phishing and ransomware — and drill employees on incident response procedures. Establish a confidential reporting channel for security concerns, incentivizing staff to flag potential threats. Reward validated reports to foster a culture of shared re-

sponsibility for data protection [17].

## 6 Case Study: Digital Transformation Practice at a Large Tertiary Hospital

#### 6.1 Background and Objectives

A leading tertiary-level hospital in its region — renowned as a benchmark for medical services — faces heavy patient volumes and complex workflows. Under its traditional management model, patients endure long waits for registration and payment, clinical information remains siloed, and decision-making lacks robust data support. To break through these bottlenecks, the hospital launched a comprehensive digital-transformation strategy aimed at:

- a)Building a one-stop patient service platform to seamlessly link online and on-site care pathways;
- b)Establishing a medical big-data platform to support clinical decision-making and research;
- c)Streamlining internal management processes to boost operational efficiency.

#### **6.2 Transformation Initiatives**

#### 6.2.1 Digital Upgrade of Patient Services

a) Online Service Platform.

The hospital rolled out an official mobile app and WeChat public account integrating appointment booking, payment, report retrieval, and tele-consultation. Patients can schedule appointments anytime, select preferred physicians and time slots, and avoid on-site queues. Multiple electronic payment options eliminate the need to visit payment counters, saving significant time. Test results are available for instant download — no more paper reports. For remote care, chronic and mobility-impaired patients can consult physicians from home.

#### b) Intelligent Triage System.

Smart triage robots and self-service kiosks — equipped with voice and touchscreen interfaces — guide patients to the correct department. After describing symptoms, the system's algorithm and knowledge base quickly recommend the appropriate clinic, minimizing aimless roaming and wait times.

#### 6.2.2 Digital Integration of Clinical Services

a) Electronic Health Record (EHR) Upgrade.

The EHR system was fully upgraded to ensure electronic, structured, and standardized records. Clinicians use templates for rapid data entry; built-in valida-

tion routines enforce completeness and accuracy. Shared access across departments prevents duplicate tests and accelerates care, while the aggregated data reservoir underpins clinical research.

b) Clinical Decision Support (CDS).

A CDS platform integrates medical knowledge bases, guidelines, and past case data. When clinicians encounter diagnostic or therapeutic dilemmas, the system analyzes patient information to suggest evidence-based options, enhancing the precision of care.

c) Tele-medicine Collaboration Platform.

To support primary-care partners, the hospital implemented a real-time video consultation network. Specialists at the tertiary center provide remote diagnosis and guidance for complex cases. Features include teleradiology and remote ECG monitoring, helping to democratize high-quality expertise and raise standards at community clinics.

6.2.3 Digital Optimization of Hospital Management

a) Operations Management Platform.

An integrated dashboard now consolidates finance, HR, materials, and equipment modules. Administrators monitor revenues, expenditures, bed occupancy, and equipment utilization in real time, quickly identifying issues and making data-driven adjustments. Built-in analytics further inform strategic planning.

b) Supply Chain Management System.

A dedicated SCM system covers end-to-end digital management of drug and consumable procurement, inventory, and distribution. The system auto-generates purchase plans based on actual usage, optimizing stock levels and reducing holding costs. Electronic connectivity with suppliers ensures timely deliveries and full traceability, improving both efficiency and safety.

#### **6.3 Transformation Outcomes**

a) Enhanced Patient Experience.

Queue times for registration, payment, and tests fell dramatically — average total visit time dropped from several hours to just 1–2 hours. Patient satisfaction surged from 70% pre-transformation to over 90%, bolstering the hospital's reputation.

b) Steady Improvement in Care Quality.

The EHR and CDS systems enabled more accurate, timely information exchange, reducing clinical errors. The tele-medicine platform extended expert resources to remote sites, elevating diagnostic and treatment standards.

c) Stronger Management Efficiency.

The operations dashboard and SCM system fostered precision and intelligence in administration. Operating costs came under tighter control — procurement expenses declined by nearly 15%, and equipment utilization rose by roughly 20%.

#### 6.4 Lessons Learned and Insights

a) Executive Sponsorship Is Critical.

Digital transformation is a systemic undertaking that demands visible, sustained support from top leadership. Clear goals and dedicated resources from executives are essential for driving progress.

b) Organization-Wide Training Lays the Foundation.

Successful change hinges on broad participation. The hospital offered multi-tiered, diverse training programs to raise staff awareness of digital tools and practices, ensuring that new systems were adopted effectively.

c) Continuous Innovation Fuels Momentum.

Given the rapid evolution of digital technologies, hospitals must stay vigilant, track industry trends, and integrate new solutions. Ongoing optimization of existing platforms ensures that digital capabilities evolve in step with clinical and operational needs.

#### 7 Conclusion

Under the business–finance integration paradigm, the digital transformation of hospital financial management has emerged as a pivotal strategy for enhancing operational efficiency and service quality. By building an integrated information system, strengthening collaboration between business and finance, developing cross-functional talent, and optimizing financial workflows, hospitals can surmount challenges such as data silos and skill gaps. Digitalization not only streamlines accounting and reporting but also refines resource allocation, augments decision-support, and bolsters risk management. The successful experience of a leading tertiary hospital illustrates that a well-designed transformation roadmap — backed by executive commitment, comprehensive training, and a culture of continuous innovation — can deliver measurable improvements in patient experience, clinical quality, and administrative performance. Moving forward, hospitals should deepen business-finance integration and propel their financial management toward ever-higher levels of digital maturity to thrive in the digital era.

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#### **Conflicts of Interest**

The authors declare no conflicts of interest.

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