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IoT-driven Framework for Enhancing Human Resource Management System in Digital Era

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In the current era of digital transformation, enterprises are increasingly reliant on intellectual capital and collaborative efficiency. Traditional human resource management systems (HRMSs) are facing significant challenges in adapting to these evolving demands. The advent of IoT presents promising opportunities for the enhancement of HRMS functionalities. While IoT technologies have been widely applied in industrial manufacturing, their systematic integration into the domain of HRM remains underexplored. In this study, we provide a comprehensive analysis of the potential benefits and challenges associated with IoT adoption in HRMSs. We propose an optimized framework grounded in a four-layer IoT architecture, incorporating sensing devices, blockchain, and AI technologies. The framework highlights sensor-based data acquisition as a fundamental enabler for real-time, human-centric information sensing in HRMSs. The proposed model addresses critical issues such as employee interaction, knowledge integration, and data privacy, with the goal of improving the real-time responsiveness and accuracy of HR operations. Although in this study we focus on framework design rather than experimental implementation, the proposed architecture is built on mature IoT and sensing technologies, suggesting practical feasibility in real organizational settings. By presenting a cohesive architecture, we offer practical insights for HRMS practitioners, system implementers, and technology developers. Moreover, in this study, we will serve as a reference for deploying IoT technologies within complex organizational ecosystems. This work is relevant to readers interested in sensing concepts, as it extends sensor-enabled systems from physical environments to organizational and human-centered applications. The main limitation of this study lies in the lack of empirical validation through prototype deployment. Future work will focus on system implementation and experimental evaluation to further verify applicability and performance. Ultimately, this work aims to foster innovation in HRMSs and strengthen the digital capabilities of modern enterprises.

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1. Introduction

IoT is a pivotal technology driving the Fourth Industrial Revolution. By integrating sensors, communication networks, and data analytics, IoT enables seamless connectivity and intelligent collaboration between the physical and digital worlds. At its core, IoT facilitates the digitalization of physical entities and leverages data-driven processes to optimize resource allocation and decision-making, thereby enhancing productivity and organizational efficiency.(1) IoT technologies encompass intelligent sensing and interconnected communication and are increasingly integrated with emerging technologies such as blockchain, AI, and cloud computing. Together, these components form a self-regulating information ecosystem capable of dynamic adaptation. The application scope of IoT has rapidly expanded to include wearable devices, smart homes, intelligent urban infrastructure, and industrial automation. According to projections by Statista, the number of connected IoT devices worldwide is expected to grow from 15.9 billion in 2023 to over 32.1 billion by 2030, effectively doubling within seven years.(2) This surge signals IoT's transition from experimental technology to mainstream commercial deployment. The trend reflects a broader shift from conventional physical devices toward intelligent, interconnected terminals. With capabilities such as real-time data acquisition, edge computing, and cloud-based collaboration, IoT has become a cornerstone of enterprise digital transformation.

More critically, IoT is fundamentally reshaping organizational management paradigms. By enabling data capitalization, service ubiquity, and system adaptivity, IoT not only streamlines production processes but also revolutionizes workforce management. Through the continuous monitoring of employee conditions, health, and knowledge exchange, IoT fosters a shift from experience-based to data-driven decision-making. As such, it serves as a vital technological enabler of workplace innovation and strategic organizational change. Enterprises are currently undergoing a profound technological transformation driven by the global shift toward the knowledge economy and digitalization.(3,4) This paradigm shift is fundamentally redefining the nature of work and is reshaping the entire enterprise ecosystem across multiple dimensions. IoT, through real-time data acquisition and analytics, is not only revolutionizing manufacturing processes but is also exerting a transformative impact on human resource management (HRM) models. By connecting intelligent devices, IoT enables organizations to conserve time and resources, thereby improving the efficiency of HRM operations and unlocking new avenues for growth. In the context of contemporary management theory, HRM is increasingly regarded as a dynamic governance mechanism. While its core functions evolve in response to both internal and external environmental changes, as illustrated in Fig. 1, its fundamental objectives remain: optimizing talent allocation, enhancing organizational performance, and cultivating a positive corporate culture to achieve sustainable development for both enterprises and their employees.

Modern enterprises, characterized by their reliance on highly skilled talent and innovation-driven growth, demand human resource management systems (HRMSs) that are adaptable, employee-centric, and capable of supporting continuous professional development. In this context, HRMSs have evolved beyond a transactional tool into a critical component of strategic enterprise management.(5) Against the backdrop of digital transformation, the integration of

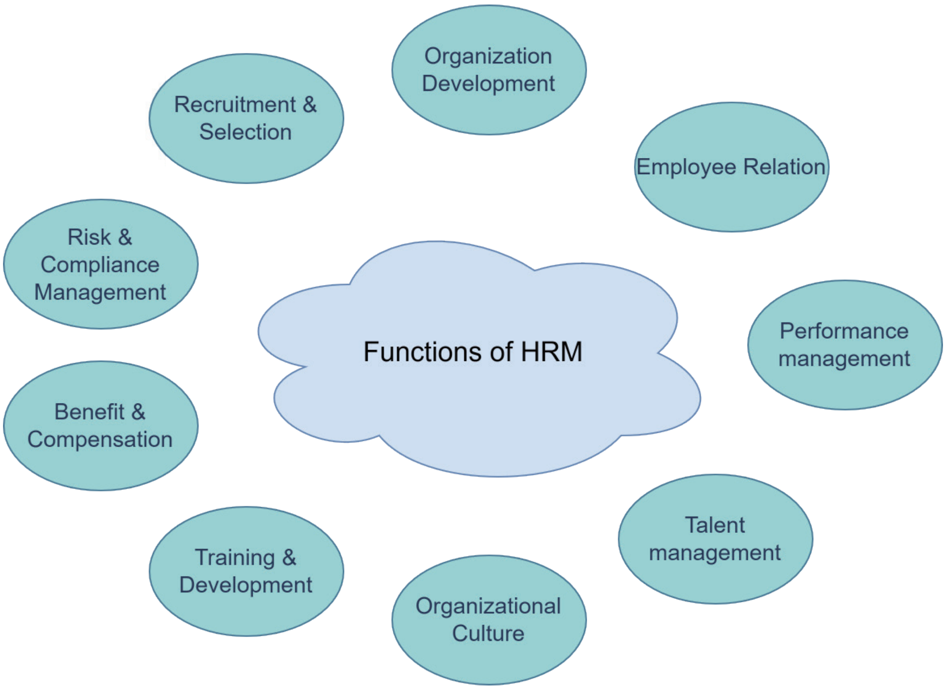

Fig. 1. (Color online) Functions of HRM.

emerging technologies such as IoT into HRM practices has become an irreversible trend. This technological convergence not only contributes to the structural enhancement of organizational governance capabilities but also plays a pivotal role in the development of agile and responsive enterprises.(6) IoT-based HRM solutions offer intelligent, precise, and adaptive approaches to managing human resources, equipping organizations to better navigate the complexities of modern markets and the volatility of business demands.(7) By embedding IoT technologies into HRMSs, organizations can transition from experience-based decision-making to data-driven strategies, a shift that is essential for fostering innovation, enhancing competitiveness, and achieving long-term progress in an increasingly dynamic business environment.

The content of this study is particularly appealing to readers of *Sensors and Materials* as it reframes sensing technologies as fundamental components of human-centric information systems rather than peripheral monitoring tools. The proposed IoT-driven HRMS framework emphasizes the role of heterogeneous sensors, including wearable sensors, smart terminals, and environmental sensing devices, in capturing real-time, multidimensional data related to human behavior, interaction patterns, and workplace conditions. From a sensing perspective, the framework demonstrates how raw sensor signals can be transformed, through edge computing and intelligent analytics, into meaningful representations that support organizational awareness and decision-making. Furthermore, the framework provides a scalable and extensible architecture that can accommodate advances in sensor materials, sensing modalities, and device miniaturization, allowing future sensor developments to be seamlessly integrated into organizational management systems. By abstracting sensing functions into a modular architecture, we offer a reference model for researchers and engineers interested in translating sensor-level innovations into higher-level applications.

In this sense, the work bridges the gap between sensor research and real-world system-level applications, illustrating how sensing concepts can be operationalized beyond traditional industrial, environmental, or biomedical domains. Traditional HRM models are facing increasing challenges in the context of modern enterprise operations. Key issues such as the rising mobility of highly skilled talent, the growing demand for individualized employee experiences, and the dynamic reconfiguration of organizational structures have exposed the limitations of conventional HRM practices. These constraints are prompting organizations to seek more advanced and adaptive solutions. As expectations for efficiency and quality in HRM continue to escalate, HRMSs are under growing pressure to evolve. Future HRMSs must be more intelligent and automated to effectively meet the demands of the digital era.[8] The next generation of HRMSs will therefore depend on the deep integration and innovative application of emerging technologies to enable more accurate, responsive, and efficient HRM. In this study, we focus on the research and development of an innovative framework that integrates IoT, AI, and other cutting-edge technologies into HRMSs.

In particular, the proposed framework emphasizes sensor-enabled, human-centric data acquisition as a foundational mechanism for capturing real-time organizational and employee-related information, extending sensing concepts from conventional physical monitoring to organizational and management-oriented applications. By leveraging sensing devices, smart terminals, and IoT infrastructures, the framework supports continuous data acquisition, edge-level preprocessing, and intelligent analysis, thereby enabling organizations to better understand employee behaviors, working conditions, and collaboration dynamics. Although in the present study we concentrate on conceptual framework design rather than full system deployment, the architecture is systematically constructed on the basis of mature and widely adopted IoT and sensing technologies, ensuring technical feasibility and practical relevance. This design-oriented approach allows key functional requirements, data flows, and security mechanisms to be clearly defined prior to implementation, which is essential for complex organizational systems. Overall, the integrated framework redefines traditional HRM by streamlining workflows, improving data governance, and supporting strategic decision-making, enabling HRMSs to transition from reactive, transactional systems to proactive, data-driven platforms that enhance management efficiency and organizational responsiveness.

2. System Architecture Design and Research Methodology

2.1 IoT architecture integrating emerging technologies

In this study, we focus on the application of IoT technologies within HRMSs. IoT offers a high degree of integration by combining sensing technologies with emerging innovations such as AI, blockchain, big data, and cloud computing. In this research, we integrate key technical components, including sensing and identification, communication and data transmission, operational support, and business application, into the four hierarchical layers of the IoT architecture, namely, the sensing, network, platform, and application layers, as illustrated in Fig. 2. Through this multilayered architecture, HRMSs can more effectively collect, process, and analyze data, enabling real-time insights and supporting intelligent decision-making. This integration significantly enhances the efficiency, accuracy, and responsiveness of HRM. The coordinated operation of the four-layer IoT framework facilitates the intelligent, real-time, and automated transformation of HR processes. In this study, the IoT architecture is developed on the basis of the core functionalities of each layer as follows.

(1) The sensing layer, positioned at the base of the IoT architecture, is responsible for interfacing the physical and digital environments by collecting raw data. It employs various technologies such as sensors, RFID, smart cameras, biometric devices, and wearable equipment to detect and capture environmental and user-specific information. This data is then converted into digital signals for subsequent processing. Within the HRMS framework, the sensing layer plays a key role in capturing real-time data on employees' work conditions, health status, and collaborative behaviors, forming the foundation for intelligent human resource analytics.

(2) The network layer functions as the communication backbone of the IoT system, transmitting data from the sensing layer to the platform layer efficiently and securely. It leverages a range of communication technologies, including the Internet, wireless networks, Bluetooth, NFC, cellular networks, and Narrowband IoT (NB-IoT), to ensure the stability and real-time nature of data transmission. In HRMS applications, this layer is designed with a focus on transmission reliability and security, supporting the continuous monitoring of employee status, operational performance, and productivity metrics across various work scenarios.

(3) The platform layer serves as the core data processing hub of the IoT architecture. It is responsible for storing, managing, and analyzing the data transmitted from the network layer. This layer integrates cloud computing, data security, and data management technologies to establish a robust platform for intelligent analytics. Leveraging big data, AI, machine learning, and blockchain technologies, the platform layer enables deep data mining to extract

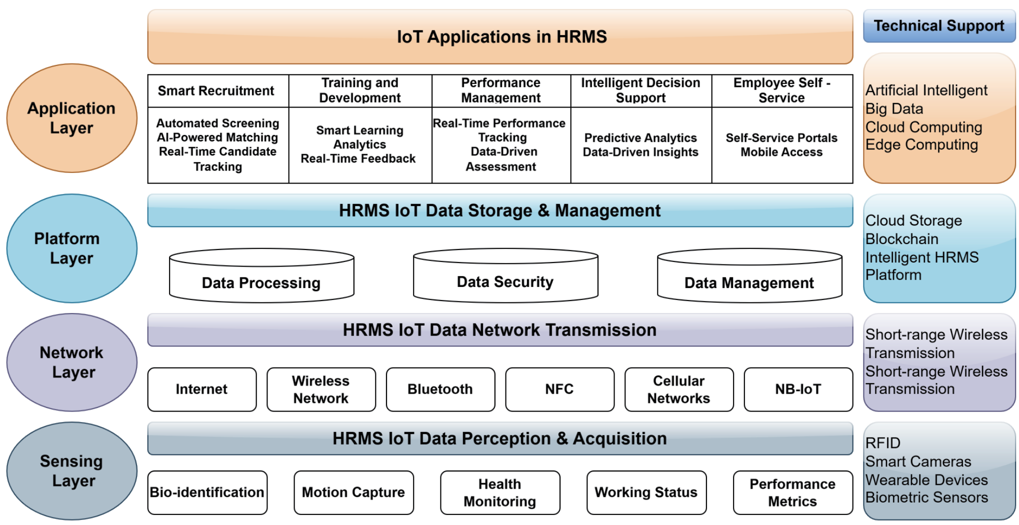

Fig. 2. (Color online) Architecture of IoT system for HRMS.

actionable insights and support decision-making in HRMSs. Additionally, it ensures data confidentiality and integrity by implementing strong security mechanisms to prevent unauthorized access and data breaches, thereby safeguarding both organizational and employee information.

(4) The application layer is the user-facing component of the IoT architecture, delivering services and functionalities directly to HRMS stakeholders, including decision-makers, managers, and employees. This layer provides a suite of intelligent applications such as smart recruitment, employee training and development, performance management, decision support systems, and self-service tools. By utilizing analytics results from the platform layer, it offers interactive dashboards and user-friendly interfaces that enable data-driven decision-making. Furthermore, the application layer supports mobile access and self-service portals, enhancing the overall HR experience and improving employee engagement and satisfaction.

2.2 Core IoT technologies for framework development

(1) AI focuses on enabling machines or computer systems to perform tasks that typically require human intelligence, such as reasoning, learning, and problem-solving. It encompasses various subfields, including machine learning, deep learning, natural language processing (NLP), and computer vision. By training models on large datasets, AI systems gain the ability to learn autonomously, make predictions, and support intelligent decision-making. In the context of HRMSs, AI can automate data analysis, provide intelligent recommendations, and identify behavioral patterns, thereby enhancing the efficiency, accuracy, and strategic value of HRM in the digital era.

(2) Big data analytics involves the storage, processing, analysis, and visualization of large-scale, multisource, and heterogeneous datasets. It integrates statistical methods, data mining, machine learning, and distributed computing to uncover hidden patterns, trends, and correlations within complex data.[9] Characterized by the four V’s, volume, velocity, variety, and veracity, big data analytics enables organizations to make more informed talent management decisions. In HRMSs, it supports key functions such as recruitment, employee retention, and performance evaluation by revealing insights into workforce behavior and operational dynamics. Moreover, it contributes to process optimization and strategic planning, helping organizations maintain a competitive edge in rapidly evolving markets.

(3) Blockchain is a decentralized distributed ledger technology that ensures data integrity, transparency, and traceability through cryptographic mechanisms. Its core components include consensus algorithms, smart contracts, and trustless systems, which enable secure data synchronization and validation across distributed nodes, eliminating single points of failure and preventing data tampering. Widely adopted in sectors such as finance, supply chain, healthcare, and identity management, blockchain enhances data security and operational transparency. In HRMSs, blockchain can be applied to decentralized identity verification, smart contract-based payroll, knowledge management, performance data authentication, and recruitment record validation, strengthening data security, transparency, and trust within human resource systems.

(4) Cloud computing provides a scalable and efficient infrastructure for data storage and processing in IoT-based systems. It enables seamless data and application sharing across devices, reducing the computational burden on edge systems and improving I/O device performance.(10) Combined with blockchain, it facilitates trusted identity verification and addresses security concerns in distributed environments. Alongside edge computing, cloud platforms support AI algorithms by providing robust computing and data resources, enabling intelligent human–computer interaction and real-world IoT applications, as illustrated in Fig. 3. In HRMSs, cloud computing enhances cross-regional management, promotes real-time data sharing and collaboration, and supports secure remote work environments. Moreover, through Software-as-a-Service (SaaS) models, organizations can reduce IT operational costs, improve system scalability, and increase HRMS management efficiency.

3. Key Issues in Current HRMSs and Improvement Objectives of IoT Technology Framework Proposed in This Study

3.1 Data security risks

HRMSs have evolved beyond traditional personnel management to include responsibilities related to data security, employment compliance, and ethical considerations. However, data security risks are becoming increasingly complex. Modern HRMSs not only handle identity information and payroll records but also sensitive biometric data, such as fingerprints, facial recognition, and heart rate. A breach of this data can lead to irreversible privacy risks. The limitations of current internet protocols, along with the unique transmission requirements of biometric data in IoT environments, exacerbate security challenges by creating vulnerabilities that malicious actors can exploit.(11) Ensuring data integrity and privacy is critical, as any breach can undermine employee trust and potentially expose organizations to legal repercussions.

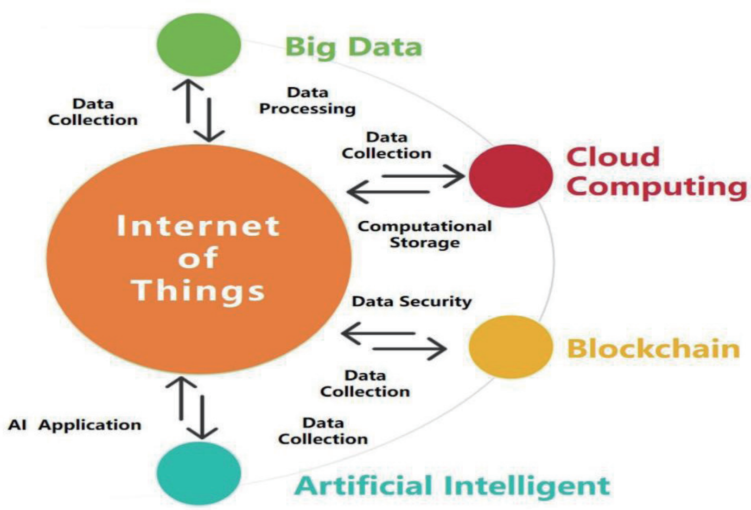

Fig. 3. (Color online) Relationship between IoT and core technologies of the framework.

3.2 Loss of organizational knowledge value

Knowledge is one of the most valuable strategic assets for any organization; however, traditional knowledge management approaches struggle to meet the innovation demands of the digital era. Many organizations still rely on manual data entry, static storage, and linear retrieval methods, which lack real-time updates and dynamic sharing capabilities. This restricts the flow of knowledge and hampers overall innovation.[12] From the perspective of the Data-Information-Knowledge-Wisdom (DIKW) model, as shown in Fig. 4, organizations often stagnate at the Data and Information stages, focused on basic data collection and storage, without progressing to Knowledge or Wisdom. Despite having large volumes of data, organizations lack effective analysis and correlation methods, preventing data from being transformed into valuable information and further refined into actionable knowledge and decision-making wisdom. Explicit knowledge is spread across departments, whereas tacit knowledge (such as experience and insights) is embedded in individual practices and shared informally.[13] Without structured management, important knowledge is difficult to capture and reuse. Traditional knowledge management systems depend on employees' subjective input, which can lead to incomplete or biased information. This creates knowledge silos, hindering quick responses to market changes, increasing repetitive tasks, and slowing innovation, ultimately reducing competitiveness. To improve competitiveness, knowledge management systems need to go beyond storing data and information. By leveraging AI and big data analytics, organizations can elevate their knowledge systems, fostering ongoing innovation and optimization.

3.3 Employee interaction and participation

Traditional HRMSs are often closed, reflecting a centralized approach from the industrial era. Key decisions, such as compensation, promotions, and training, are unclear and treated as a

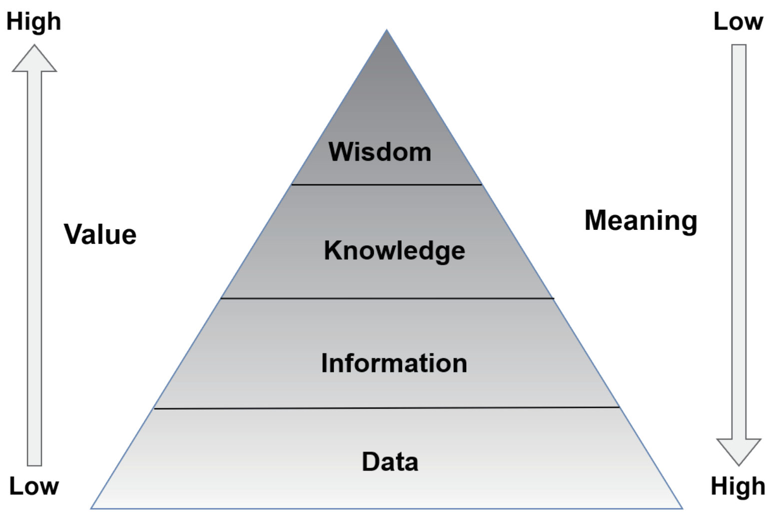

Fig. 4. DIKW pyramid.

"black box". Employees struggle to understand the rationale behind these decisions and have little influence over them, becoming passive implementers instead of active collaborators. This leads to a one-way decision-making process, where feedback flows only from management to employees. Employee input and data rarely reach decision-makers, and management relies on outdated HR reports that miss real-time employee contributions. Without transparent evaluation criteria and participation channels, employees lose engagement in decision-making, affecting job satisfaction, retention, and overall performance.

4. IoT-based Enhancements and Outcomes in HRMSs

4.1 Construction of a high-security data management architecture for HRMSs

Data security and privacy protection have become critical and persistent challenges in the development and deployment of HRMSs. With the proliferation of IoT, HRM platforms are increasingly required to process sensitive and diverse employee data, ranging from health records and payroll information to performance evaluations. Under these conditions, traditional centralized storage architectures are proving inadequate in meeting modern enterprises' demands for robust data security and compliance with increasingly stringent privacy regulations. Although centralized models offer simplicity and efficiency, they inherently suffer from major vulnerabilities, especially with respect to data breaches and unauthorized access. These shortcomings primarily stem from reliance on static encryption methods, which are insufficient to defend against dynamic and sophisticated cyber threats. As such, advanced technologies, including decentralized storage, dynamic access control, and multi-party privacy-preserving computation, have gained recognition as effective countermeasures to address these issues. In this study, we fundamentally redesigned the traditional centralized HRMS data architecture by introducing a decentralized data governance framework, as illustrated in Fig. 5. This framework integrates blockchain technology, distributed data storage, and privacy-enhancing computation to optimize how HR data is stored, accessed, and shared, with the goal of improving overall system security and compliance capabilities.

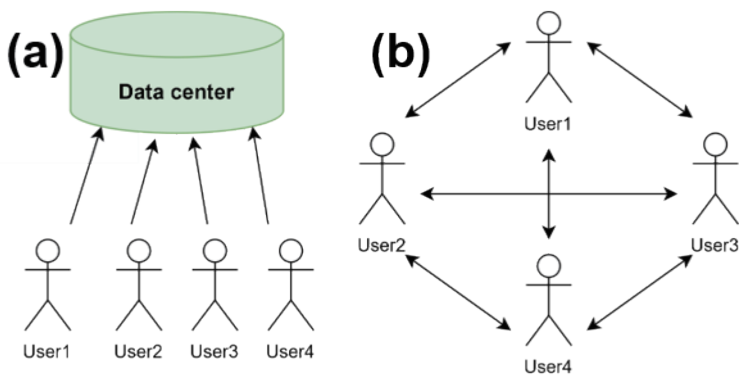

Fig. 5. (Color online) (a) Traditional and (b) blockchain-based data storage models.

The use of blockchain technology provides an immutable and transparent distributed ledger that guarantees data integrity and traceability. All data operations are recorded on-chain, which significantly enhances auditability.(14) Smart contracts are implemented to enforce fine-grained access control policies, ensuring that only authorized parties, such as HR personnel or the data subjects themselves (i.e., the employees), can access specific datasets. This not only prevents the internal misuse of sensitive data but also strengthens employee confidence in the system's integrity. Moreover, centralized HRMS architectures are susceptible to single points of failure, making them attractive targets for cyberattacks. The incorporation of distributed storage mechanisms fragments data and distributes it across multiple independent nodes. This architecture enhances redundancy and system resilience, thereby reducing the risk of large-scale data loss or exposure due to external attacks. Given the multifaceted functions of HRM, including payroll processing, performance assessment, and health data management, there exists an inherent conflict between the operational necessity for data sharing and the obligation to preserve user privacy. To resolve this, privacy-preserving computation techniques such as federated learning, homomorphic encryption, and zero-knowledge proofs are adopted. These technologies enable secure data interoperability between modules without revealing the underlying raw data.

Results from the implementation confirm the effectiveness of the proposed system. Using homomorphic encryption, the HR department was able to analyze encrypted employee health indicators to evaluate their correlation with work performance, without directly accessing the original health data. This not only ensured full compliance with data privacy regulations but also enabled meaningful, data-driven insights to support HR decisions. The reported security improvement metrics were derived from a comparative system-level security evaluation based on simulated attack scenarios commonly adopted in previous studies on distributed and privacy-preserving information systems. Specifically, vulnerability exposure was quantified by comparing the number of successfully exploitable attack vectors, such as unauthorized data access, single-point failure compromise, and data leakage risk, between the proposed distributed architecture and a conventional centralized HRMS under identical threat assumptions. Based on this comparative simulation framework, the proposed system exhibited a 66.5% reduction in overall vulnerability exposure relative to the legacy centralized model. Additionally, system availability increased owing to distributed redundancy, and employee trust levels were assessed through post-implementation questionnaire-based surveys focusing on perceived transparency, data security, and system reliability. The reported 43.4% increase reflects the relative improvement in aggregated trust-related indicators compared with baseline responses collected prior to system integration. These results collectively indicate that the proposed IoT-enabled, privacy-aware HRMS framework not only enhances security robustness but also strengthens organizational trust and system acceptance.

4.2 Knowledge collaboration enabled by IoT

Enterprise knowledge management and sharing are often hindered by fragmentation across organizational and inter-organizational boundaries. This leads to the formation of multi-source, heterogeneous, and distributed data silos, which can obstruct effective knowledge sharing, collaboration, and innovation within and between organizations.[15] Traditional knowledge management models are characterized by inefficiencies and fragmentation, limiting the capacity for sustained innovation and rendering them inadequate in supporting dynamic knowledge flows and accumulation in rapidly evolving environments. To overcome these limitations, it is essential to develop an intelligent, collaborative knowledge ecosystem. By leveraging technologies such as IoT sensors, NLP, and blockchain, enterprises can achieve automated knowledge acquisition, dynamic association, and secure sharing. These technologies collectively enhance the efficiency of organizational knowledge management and foster innovation potential. The proposed knowledge collaboration management system in this study is structured around four core layers, namely, intelligent perception, knowledge fusion, knowledge sharing, and application interaction, as illustrated in Fig. 6.

RFID/NFC technologies are employed for the automatic identification and management of physical documents, devices, and knowledge carriers, enabling the digital perception of knowledge assets. Smart terminals and sensors (e.g., wearable devices and industrial sensors) are used to capture real-time operational data, providing the foundation for data-driven knowledge accumulation. Edge computing is utilized to preprocess locally collected data, reducing the computational load on the cloud and improving system responsiveness. Subsequently, knowledge graphs and NLP techniques integrate and semantically link the data, while blockchain ensures traceability and data security, facilitating trusted knowledge exchange both within and across enterprises. Additionally, intelligent recommendation systems enhance the precision and

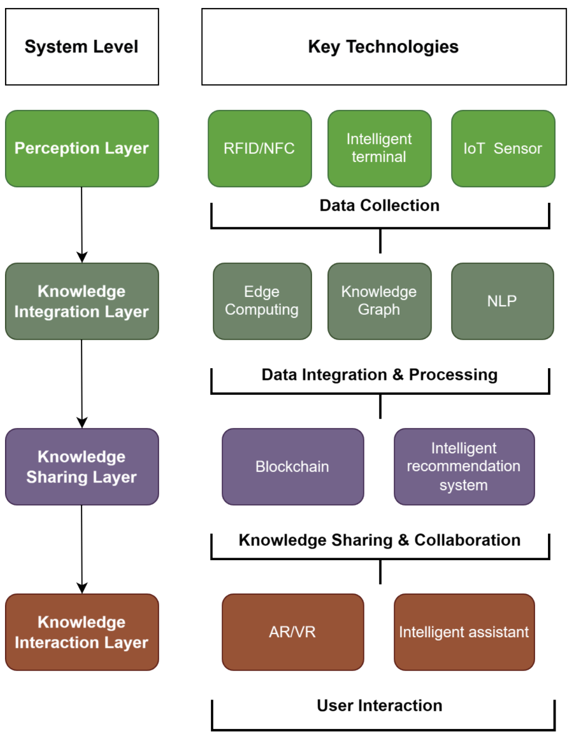

Fig. 6. (Color online) Knowledge collaboration management framework.

security of knowledge flows, whereas AR/VR technologies and virtual assistants offer immersive and interactive user experiences. The architecture proposed in this study successfully dismantles knowledge silos and streamlines the flow of information across organizational units. It significantly improves the efficiency with which members access and utilize relevant knowledge, leading to enhanced innovation capability. The system not only reduces information redundancy but also accelerates the acquisition of actionable knowledge by employees. These advancements collectively contribute to the establishment of a highly efficient, intelligent, and trustworthy knowledge collaboration ecosystem, one that supports rapid innovation and sustained competitive advantage in dynamic industrial contexts.

4.3 Establishing a bidirectional interaction mechanism through IoT

In traditional enterprise management models, the value-creating potential of employees in the decision-making process has long been underestimated. Research indicates that involving employees in the design and communication of decision-making mechanisms not only enhances their sense of ownership and alignment with organizational goals but also activates latent innovation capabilities. With the advent of intelligent technologies, this theoretical framework has gained new avenues for practical implementation. By establishing a bidirectional interaction mechanism between employees and decision-making systems, as illustrated in Fig. 7, organizations can simultaneously enhance environmental monitoring capabilities and mitigate resistance to change, thereby improving the overall user experience in the workplace.[16] The integration of IoT technologies plays a critical role in enabling this process. Through the deployment of smart sensing devices and data analytics platforms, enterprises can construct real-time feedback systems.

These sensing devices continuously collect dynamic behavioral data from the operational environment, such as equipment usage frequency and the intensity of collaborative interactions, and transform this information into quantifiable inputs for managerial decision-making. Concurrently, employees gain immediate access to operational performance indicators and

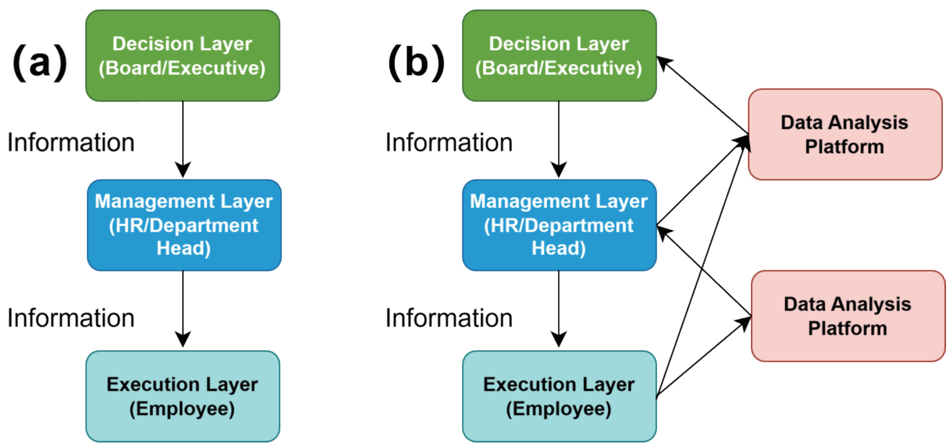

Fig. 7. (Color online) (a) Traditional decision-making and (b) dual-direction feedback flows.

resource allocation metrics through user-friendly, visualized dashboards, enabling a more transparent and participatory engagement in business operations. This technology-enabled co-governance model not only improves the precision of workforce management but also redefines organizational trust through enhanced transparency. The result is a more agile and resilient smart management paradigm, one that fosters mutual responsiveness between systems and human agents, accelerates organizational adaptability to external changes, and creates a participatory innovation environment. Ultimately, this approach contributes to higher operational efficiency, greater employee empowerment, and a sustainable competitive advantage driven by data-informed collaboration.

5. Conclusion

In this study, we proposed an innovative IoT-driven HRMS framework designed to address critical challenges related to efficiency, collaboration, and data security. By integrating sensing devices, edge computing technologies, and blockchain-based privacy protection mechanisms, the framework enhances the real-time accuracy of data integration, improves the adaptability of collaborative environments, and supports secure data management. The proposed framework emphasizes sensor-enabled human-centric data acquisition as a foundational element for responsive and intelligent HRMS operations. Furthermore, the framework streamlines HR management processes through automation and intelligent optimization, effectively reducing administrative burdens and increasing operational efficiency. Beyond its technical contributions, in this study, we also provide a practical guidance for policymakers, system implementers, and technology developers, while also serving as a reference model for the real-world application of IoT in organizational management. Although in the present work we focused on conceptual framework design rather than system deployment, it is built on existing IoT and sensing technologies, indicating feasibility for real-world implementation. Specifically, the proposed architecture can be incrementally deployed using commercially available sensors, IoT platforms, and cloud–edge infrastructures, allowing organizations to adopt the framework without fundamental changes to existing HR information systems. This modular and implementation-oriented design supports phased integration and pilot deployment in real organizational environments, thereby demonstrating that the proposed system is practically deployable rather than purely theoretical. The main limitation of this study lies in the absence of empirical validation and large-scale deployment. It demonstrates the transformative potential of IoT in driving HRMS innovation and improving the delivery of public services. Future work will focus on the empirical validation and scalability assessments of the proposed framework, with the goal of adapting it to evolving business requirements and ongoing technological advancements.

Acknowledgments

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