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INTEGRATION OF ARTIFICIAL INTELLIGENCE AND IT TECHNOLOGIES: A MODEL FOR DIGITAL TRANSFORMATION, EFFICIENCY, AND RESPONSIBLE INNOVATION

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Abstract: This article examines the integration of artificial intelligence (AI) and information technology (IT) in digital transformation. It proposes a conceptual model linking infrastructure, data governance, staff competencies, and outcome evaluation. Systemic analysis, comparative analysis, functional analysis, and synthesis were applied to guidance from OECD, UNESCO, NIST, and ISO/IEC. The resulting five-stage model runs from needs identification to monitoring and continuous improvement. It is a conceptual proposal, not an empirically validated solution.

Keywords: artificial intelligence, information technology, digital transformation, data governance, automation, innovation.

Introduction

The development of information technologies is fundamentally transforming how data is created, stored, processed, and utilized within organizations, educational institutions, and public services. Cloud computing, big data, internet-connected devices, software platforms, and cyber-physical systems are becoming core components of digital infrastructure. When artificial intelligence (AI) is integrated into this infrastructure, it expands capabilities for identifying patterns in data, automating processes, supporting decision-making, and offering personalized services to users. However, simply connecting an AI tool to an existing IT system does not guarantee successful digital transformation. If factors such as data quality, interoperability, information security, costs, staff preparedness, and the measurement of technological outcomes are overlooked, the expected efficiency gains may fail to materialize. The OECD AI Principles advocate for the development of AI that is trustworthy, human-centered, and responsible. Meanwhile, the NIST AI Risk Management Framework provides an approach for incorporating risk identification, assessment, and mitigation into the entire life cycle of an AI system.

This article examines AI and IT not as separate domains, but as a complementary digital ecosystem. The primary focus is on the management process—spanning from technology selection to the evaluation of outcomes and continuous improvement.

Research Goal and Objectives

The goal of this research is to propose a conceptual model that integrates technological, organizational, and human factors to ensure the responsible and effective incorporation of AI and IT solutions into organizational operations.

Research objectives: (1) to identify key areas for the integration of AI and IT; (2) to systematize the technical and organizational challenges associated with implementation; (3) to conduct a comparative analysis of international management principles; and (4) to develop implementation stages and evaluation criteria.

Research Object and Subject

The object of the research is the process of implementing and utilizing digital technologies within organizations. The subject of the research consists of the conditions for

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aligning AI capabilities with IT infrastructure, data management, human competencies, and mechanisms for evaluating outcomes.

Scientific-Theoretical Foundations and International Approaches

When analyzing the integration of AI and IT, it is essential to recognize that digital transformation entails more than just upgrading technical systems. It also impacts workflows, management models, the culture of working with data, and employee skill sets. Consequently, integration projects must address both technical architecture and organizational change in a coordinated manner.

The OECD Recommendation on Artificial Intelligence establishes principles for the innovative and trustworthy development of AI systems, emphasizing respect for human rights and democratic values, as well as transparency, safety, and accountability. These principles help ensure that IT projects account for user interests, the explainability of system outcomes, and the clear assignment of responsibility.

The NIST AI Risk Management Framework (AI RMF 1.0) structures the management of AI risks through functions such as governance, contextualization, measurement, and response. This framework provides a foundation for the systematic assessment of risks throughout the entire project lifecycle—from inception through to operational deployment and monitoring.

ISO/IEC 42001:2023 is an international standard that specifies requirements for establishing, implementing, maintaining, and continually improving an artificial intelligence management system within an organization. It is aimed at systematizing tasks, policies, and controls related to IS across the organization.

Although UNESCO's guidance on generative AI focuses primarily on the context of education and research, its principles—such as prioritizing human interests, ensuring privacy, providing appropriate training, and aligning with pedagogical goals—are also significant when designing digital services related to knowledge production. These sources provide distinct yet complementary foundations for the conceptual model presented in this article.

Research Methodology

The research is based on conceptual and documentary analysis. The sources selected for analysis include the OECD Principles on Artificial Intelligence, the NIST AI Risk Management Framework, the ISO/IEC 42001:2023 standard, UNESCO's guidance on generative AI, and relevant scholarly literature. The selection criteria prioritized the direct relevance of these sources to the topic, their formal status, their verifiability, and their content concerning AI-IT integration, governance, or risk management.

1. Systems analysis method. This method was employed to examine the integration of AI and IT as a system composed of interconnected components. The analysis explored the relationships between technological infrastructure, data quality and governance, software integration, staff competencies, information security, and the evaluation of outcomes. This approach helped to determine that the outcome of the integration depends not only on the technical capabilities of the AI model, but also on the coherence of the entire organizational-technical environment.

2. Comparative analysis method. The OECD principles, NIST AI RMF, ISO/IEC 42001, and UNESCO guidelines were compared based on their objectives, scope, and primary focus areas. The comparison took into account criteria such as accountability and transparency, risk identification and management, organizational-level governance, human interests, and relevant competencies. The analysis revealed that, rather than merely duplicating one another, these sources complement each other by addressing different facets of the responsible implementation of AI systems.

3. Functional analysis method. Practical functions arising from the integration of AI and IT—such as automating repetitive processes, identifying patterns and trends in data, supporting decision-making, assisting in education and research, and strengthening cybersecurity—were examined individually. For each function, the conditions for its application and potential limitations—including data quality, interoperability, privacy, costs, and human oversight—were evaluated. Consequently, it was established that functional benefits must be assessed in conjunction with associated risks and resource requirements.

4. Generalization method. The common principles and challenges identified throughout the systemic, comparative, and functional analyses were synthesized into a unified logical framework. On this basis, a five-stage conceptual model was developed, encompassing the following phases: needs assessment, preparation of data and infrastructure, controlled integration, evaluation of results, and monitoring and improvement. Furthermore, this synthesis facilitated the identification of specific evaluation criteria—covering operational efficiency, service quality, economic efficiency, technical stability, security, and the human factor—to enable the practical validation of the model.

A limitation of this study is that no new empirical data were collected; no surveys or experiments were conducted, and no statistical calculations regarding economic efficiency were performed. Consequently, the five-stage model is presented not as an empirically validated solution, but as a conceptual proposal developed by the author based on an analysis of international sources. To determine its effectiveness, future pilot testing is required, along with a comparison of the results against baseline indicators.

Key Areas for the Integration of Artificial Intelligence and IT

Process Automation and Operational Efficiency

When integrated with IT systems, AI can support tasks such as document classification, routing of inquiries, data retrieval, the execution of repetitive operations, and service delivery processes. However, the process itself must be analyzed prior to automation; automating an inefficient process without first modifying it may simply transfer existing problems into the new system.

Data Analysis and Decision Support

AI models can assist in identifying trends within large datasets, estimating potential demand, highlighting anomalies, and comparing various scenarios. Such results provide additional information to the decision-maker; however, the quality of the data, model assumptions, and uncertainties must be taken into account. High-impact decisions should not rely solely on automated recommendations.

Cloud Infrastructure and API Integration

Cloud platforms and application programming interfaces (APIs) facilitate the integration of AI services into existing information systems. At the same time, this introduces considerations such as dependency on service providers, service continuity, data residency (where data is stored), access rights, the protection of API keys, and cost management. The architectural design must also account for potential service interruptions and the possibility of switching providers.

Education, Scientific Research, and Knowledge Exchange

Generative AI can assist with the preliminary analysis of text, the explanation of topics, the preparation of code samples, the formulation of questions, and the adaptation of educational materials. In such cases, it is essential to verify the generated text and code, validate sources, protect confidential information, and appropriately disclose the use of AI assistance. AI tools should not replace independent human analysis or the responsibility of the author.

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Cybersecurity and System Stability

While the integration of AI and IT systems can create new security capabilities, the overall security of the digital infrastructure remains a fundamental requirement. Identity and access management, encryption, backups, audit logs, vulnerability management, and incident response procedures must also be applied to SI components.

Implementation Challenges and Risks

Data Quality and Governance

The outcomes of AI systems depend largely on the completeness, relevance, accuracy, and representativeness of the data used. Data duplication across different systems, incompatible formats, or delays in updates can occur. Therefore, it is essential to designate data owners, establish quality criteria, and manage access rights.

Interoperability and Technical Debt

Integrating modern AI services with legacy information systems may require additional development, testing, and maintenance. When selecting a solution, one must consider not only the initial costs but also expenses related to licensing, computing resources, data preparation, staff training, monitoring, and updates.

Privacy, Information Security, and Legal Compliance

Entering personal or commercially sensitive data into systems can create a risk of unauthorized data disclosure. Organizations should implement measures such as data minimization, restricting access rights, defining data retention periods, and vetting the terms of third-party services. Implementation must comply with relevant national legislation and organizational policies.

Digital Competence of Employees

The successful application of technology depends on users' understanding of it and their ability to critically evaluate its outcomes. It is advisable to implement practical training for employees, establish usage guidelines, provide support channels, and create mechanisms for the continuous updating of knowledge.

Misjudging Efficiency

Evaluating efficiency solely based on system speed or the number of operations performed is insufficient. The impact of a solution on quality, error rates, user experience, overall costs, and security must also be measured. Without pre-establishing a baseline and comparison criteria, it becomes difficult to reliably interpret the results obtained.

Author's Proposal: A Five-Stage Model for AI and IT Integration

A five-stage conceptual model is proposed to align the implementation process with international principles. Its objective is to integrate several key phases into a unified process: identifying needs before selecting a technological solution, preparing data and infrastructure, executing a controlled integration, and continuously evaluating the results.

Discussion

The effectiveness of integrating AI and IT is determined not only by the technical capabilities of the model but also by an organization's processes, data management, staff competencies, and risk management systems. The technology must align with existing processes, meet security requirements, and provide clear value to users.

The proposed model allows for the sequential assessment of both technical and organizational factors. Its practical application can be adapted based on an organization's size, sector, data sensitivity, and existing infrastructure. To validate the model's effectiveness, future efforts should include pilot tests across various organizations, cost-benefit analyses, and empirical research on user experience.

Conclusion

The integration of artificial intelligence and IT creates new opportunities for data analysis, service automation, decision-making support, and the enhancement of digital services. However, the outcome depends not merely on the technology itself, but also on the accurate identification of needs, data quality, technical compatibility, security, staff preparedness, and the systematic evaluation of results. The article proposes a five-stage conceptual model consisting of needs assessment, preparation of data and infrastructure, controlled integration, evaluation of results, and ongoing monitoring and improvement. Its scientific and practical contribution lies in linking the implementation process to international management principles and systematizing evaluation criteria.

Organizations are advised to initiate AI and IT projects through small-scale pilots, compare outcomes against baseline metrics, incorporate security and privacy considerations from the design phase, and base decisions regarding scaling on empirical evidence. Future empirical research should examine the effectiveness, costs, and limitations of the proposed model across various sectors.

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