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SCIENCE AND EDUCATION IN THE THIRD MILLENNIUM:

Information Technology, Education, Law, Psychology, Social Security And Work, Management

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The collective monograph is the result of the generalization of the conceptual work of scientists who consider current topics from such fields of knowledge as: pedagogy, history, computer science, (AI) artificial intelligence, law, physical culture, through the prism of interactive technologies in education.

For scientists, educational staff, PhD candidates, masters of educational institutions, university faculties, stakeholders, managers and employees of management bodies at various hierarchical levels and for everyone, who is interested in current problems of pedagogy, history, computer science, (AI) artificial intelligence, law, physical culture, through the prism of interactive technologies in education.

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CHAPTER 3.
INFORMATION TECHNOLOGIES AND FOUNDATIONS OF ENTERPRISE DIGITAL TRANSFORMATION IN THE CONTEXT OF EUROPEAN INTEGRATION

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Abstract. The article is devoted to a systematic and multidimensional study of the modern landscape of information technologies that shape the structure of digital transformation at the macroeconomic and microeconomic levels. The work provides a deep conceptual demarcation between the processes of hardware digitization, algorithmic digitalization, and strategic business model transformation. The study is based on an analysis of the European infrastructure and regulatory context, in particular the "Digital Decade 2030" program, the "Twin Transition" concept, and the latest legislative acts (Data Act, AI Act) that define new standards for cybersecurity and interoperability.

Special focus is directed toward the evolution of the corporate management technology stack. The transition from rigid robotic process automation (RPA) scripts to the paradigm of hyperautomation and the deployment of autonomous systems based on Agentic AI is analyzed in detail. The engineering principles of applying Process Mining technologies for reengineering corporate networks are explored. Using the Ukrainian market as an example, the article highlights the critical issue of enterprise migration from obsolete sanctioned software (legacy systems) to modern cloud ERP solutions and Open-Source platforms. An overview of integration technologies (API, ESB) and electronic document management systems using cryptographic tools (QES) is provided. The monograph concludes with strategic forecasting of key IT trends up to 2030, where the inevitability of the transition from monolithic isolated systems to open digital ecosystems managed by artificial intelligence algorithms and Zero Trust architecture is substantiated. The work is intended for researchers, IT architects, digital transformation project managers, and corporate governance specialists.

Keywords: Information Technology, Digital Transformation, Enterprise Structure, Hyperautomation, Agentic AI, Process Mining, ERP Systems, Open Digital Ecosystems.

Introduction. In the modern global economic landscape, information technologies have transformed from a supportive tool for business processes into a fundamental basis for competitiveness, survival, and strategic development of organizations. We are witnessing an epochal shift where an enterprise's digital maturity determines its ability not only to adapt to changing market conditions but also to independently establish new market standards. At the same time, this technological transition is accompanied by a profound conceptual crisis: scientific and managerial discourse is plagued by a dangerous synonymization of the concepts of "digitization," "digitalization," and "digital transformation." Such terminological uncertainty leads to strategic errors, ineffective investment in "patchwork" automation, and the neglect of systemic architectural challenges *(Winikoff P., 2026)*.

The relevance of this study is driven by the need for a scientific understanding of the phenomenon of digital transformation under the conditions of the "Twin Transition" – the parallel digitalization and greening of the economy, which is a key vector of European Union policy. For Ukraine, this process is complicated by challenges related to the need to simultaneously restructure IT infrastructure, abandon legacy sanctioned software solutions, and build sovereign digital ecosystems capable of maintaining resilience under martial law.

Terminological ambiguity acts as a significant barrier to effective enterprise architecture. Equating digital transformation with the conversion of paper archives into an electronic format negates the need for a radical restructuring of business logic and real-time data integration. This article establishes a clear demarcation, wherein digitization is interpreted as a technical stage, while transformation is defined as a fundamental change in management architecture that requires going beyond isolated IT systems.

The article aims to formulate a conceptual model of digital transformation for enterprises based on integration into the European digital space and the use of intelligent architectural solutions. The object of the study is defined as the processes of integrating information technologies into the corporate governance structure, and the subject is the architectural principles, technological tools, and management mechanisms that facilitate the transition of organizations to an open digital ecosystem format.

The research is based on an analysis of the modern technological stack: from ERP systems and electronic document management to the implementation of Agentic AI and Zero Trust architecture. Special attention is paid to integration technologies (API, ESB) that allow enterprises to interact with financial institutions, counterparties, and state GovTech registries as a single continuous organism. The scientific novelty of the work lies in the substantiation of an "ecosystem management" model, where IT infrastructure is designed not as a static database, but as an open, dynamic network capable of self-optimization. It is proven that successful transformation is achieved solely through a balanced combination of advanced algorithmic solutions and the optimization of processes liberated from routine operations *(Мазур Г., Макогонов А., 2025)*.

1. Theoretical and Methodological Foundations of Business Digital Transformation.

1.1 Information Technology as a Determinant of Digital Change: From Hardware Digitization to Strategic Transformation of Business Architecture.

In contemporary scientific, engineering, and business discourse, there is a complex and dangerous tendency to synonymize concepts that, de facto, describe entirely different levels of technological integration of information systems into organizational activities. The terms "digital transformation," "digitalization," and "digitization" are often used interchangeably, creating conceptual chaos both at the top-management level and during IT architecture design. This is a fundamental managerial and engineering challenge, as a misunderstanding of the essence of these processes leads to irrational investments in point-to-point IT solutions (so-called "patchwork IT" or "siloed automation") with vain expectations of strategic results. At the same time, attempts to implement ecosystem solutions without a proper infrastructural foundation and normalized databases inevitably end in failure *(Winikoff P., 2026)*.

The purpose of this section is to conduct a clear scientific and architectural demarcation between these concepts and to analyze their impact on IT Governance practices. We operate on the hypothesis that digital transformation is not a static end-state of an enterprise's information system, but a permanent process of sociotechnical adaptation. In this paradigm, information technology acts not merely as an enabler, but as a full-fledged driver of fundamental reengineering changes.

To build an effective and resilient IT strategy, it is necessary to view digital change as an evolutionary continuum that unfolds across hardware, software, and architectural levels, transitioning smoothly through three qualitatively distinct stages.

Digitization is defined as the fundamental technical process of converting analog information into a digital format. At this level, physical objects are encoded into discrete binary data, rendering them suitable for computer processing.

The essential characteristics and the IT dimension of this stage are revealed through several key aspects. The direct objects of impact here are the data themselves and the physical information media. In turn, the technological implementation mechanism relies on Optical Character Recognition (OCR) systems, various analog-to-digital converters, scanning technologies, and the collection of primary telemetry via Internet of Things (IoT) devices. The primary architectural goal is to ensure Data Storage, absolute integrity, and seamless availability of data through the creation of basic Data Warehouses or large-scale Data Lakes.

From the perspective of Enterprise Architecture, digitization in itself does not change a business process in any way; it merely translates it into an electronic dimension (e.g., saving a scanned invoice on a server instead of in a paper archive). However, it creates a critically important raw resource base, without which any subsequent deep automation or the use of artificial intelligence is technically impossible *(Tsiavos V., Kitsios F., 2022)*.

Digitalization represents a qualitative transition from the mere presence of digital data on corporate servers to their active exploitation using digital technologies to optimize workflows, significantly increase efficiency, and reduce transaction costs.

This stage is characterized by a deeper penetration of technology into operational activities, where the objects of impact become business processes and interaction algorithms within and outside the company. The technological foundation is formed through the implementation of comprehensive Enterprise Resource Planning (ERP) systems, CRM systems, Business Process Management Systems (BPMS), and Robotic Process Automation (RPA) tools for routine operations. Within the context of the "sensemaking" concept, if digitization is the hardware-based collection of data (a kind of "sensing" of the environment), then digitalization is their software-based "sensemaking," which involves filtering, structuring, and automating appropriate system responses.

It is important to emphasize that at the digitalization stage, the company's global business model usually remains unchanged, while only the toolset for task execution is transformed. In academic literature, this phenomenon is classified as "IT Optimization" – the improvement of existing transactions without creating fundamentally new value propositions for the market.

Digital transformation represents the highest level of digital evolution, involving a radical shift in an organization's operating logic, corporate culture, and business model through the end-to-end integration of advanced information technologies.

This strategic transition is global in nature, as the objects of impact are the company's overarching strategy, its architecture, and its external ecosystem of partners. The technological foundation for these changes includes microservices architecture, Cloud-native technologies (cloud computing), Artificial Intelligence (AI), Open APIs, and the cutting-edge technology of Digital Twins. The management objective is to create entirely new customer value and to technologically disrupt the market (for example, a company transitioning from the one-time sale of physical goods to a service-based subscription model, or "Product-as-a-Service") *(Themistocleous M., Papadaki M., 2021)*.

From an engineering perspective, this signifies a complete move away from monolithic legacy architectures in favor of agile, component-based systems, where each module scales independently, and the focus of the entire IT infrastructure centers on improving the Customer Experience (CX) as the primary metric of market success.

We summarize the classification and attributes of digital processes in Table 1.

Table 1

Classification and attributes of digital processes in the IT paradigm

System attribute	Digitization	Digitalization	Digital Transformation
The main focus of the system	Data, formats, analog objects	Processes, operations, execution logic	Business model, ecosystem, people
Key IT action	Conversion (Encoding), parsing	Automation, Orchestration, Integration	Architectural Reengineering, Disruption
Value creation	Information preservation and accessibility	Efficiency, cost reduction	New revenue streams, new customer experience
Horizon of influence	Operational (employee tasks)	Tactical (departmental functions)	Strategic (enterprise, market position)

In management practice, it is critical to understand the evolution of the role of IT within a company and to clearly distinguish between traditional IT strategy and modern digital business strategy. Historically, traditional IT strategy (within the ITSM/ITIL paradigm) was viewed exclusively as functional support. In this model, the IT department was perceived as a cost center, with its primary mandate being the uninterrupted management of servers and the maintenance of existing business processes at the lowest possible cost to the organization.

In contrast, modern digital strategy extends far beyond the server room, directly dictating the company's strategic development trajectory and transforming the IT department into a profit center. An effective digital IT strategy is based on four integrated components. The first is data-driven customer analysis, which involves utilizing predictive big data analytics to forecast user behavior at every stage of the sales funnel. The second critical element is an omnichannel architecture – the construction of a unified enterprise service bus (ESB) that enables the synchronization of customer interactions across various channels in real-time.

The third component is a focus on user experience (UX/UI), realized through the design of intuitive interfaces capable of completely concealing backend engineering complexity from the end consumer. Finally, the fourth component lies in maintaining a balance between "Optimization vs. Transformation" through the application of the Bimodal IT concept. This allows an organization to simultaneously ensure stable support for existing enterprise systems (the ERP core) and carry out agile development of innovative digital products via autonomous Agile teams *(Themistocleous M., Papadaki M., 2021)*.

Perceiving digital transformation exclusively as a technological or engineering project is a systemic error, which, according to statistics, leads to the failure of over 70% of initiatives. A modern organization is a complex sociotechnical system where corporate immunity often rejects large-scale IT initiatives due to a series of deep-seated cultural barriers.

First and foremost, a significant obstacle is the fear of automation. The implementation of AI algorithms or robotic systems often causes staff to worry about losing their jobs or their professional expertise, which gives rise to covert sabotage of innovation. Another substantial problem is organizational and informational "silos" – the existence of fragmented databases where departments refuse to share information via APIs. This makes the creation of a unified corporate customer profile technically impossible. Furthermore, the process is hampered by a rigid hierarchy (Waterfall culture): traditional management verticals block rapid software development (Agile) and limit the autonomy of cross-functional teams. Finally, accumulated technical debt and a low tolerance for failure create a culture that severely punishes malfunctions, thereby discouraging the testing of innovations based on the "fail-fast" principle.

For a systematic and secure overcoming of these barriers, it is advisable to apply John Kotter's 8-Step Change Management Model, adapted for large-scale IT projects:

1. Create a sense of urgency: Demonstrate to leadership the technological lag behind competitors or the critical cybersecurity risks inherent in legacy systems.

2. Form a guiding coalition: Build a powerful cross-functional group consisting of lead IT architects and business leaders.

3. Develop an IT vision: Clearly model and visualize the enterprise's target architecture ("to-be" architecture).

4. Communicate the vision: Explain the benefits of new systems to staff in terms of clear business value, avoiding excessive technical jargon.

5. Empower employees for broad-based action: Provide employees with the necessary access rights, licenses, and appropriate technical training.

6. Generate short-term wins (MVP): Quickly launch a Minimum Viable Product (e.g., deploying a simple reporting bot) to visually demonstrate initial positive results.

7. Consolidate gains (Scaling): Strategically scale cloud infrastructure or successful Agile practices to other organizational units.

8. Institutionalize change: Deeply embed new IT practices (daily stand-ups, automated testing, CI/CD processes) into the daily corporate culture.

For strategic design and investment planning, IT directors require objective, measurable tools to assess the current (as-is) state of the organization. Digital maturity models serve as a kind of architectural compass, allowing for a comprehensive evaluation of a company's readiness across several integrated dimensions.

The baseline criterion is Business-IT Alignment, which reflects the extent to which the IT department's technological objectives are synchronized with the enterprise's key performance indicators (KPIs). The next essential metric is IT Capability – a comprehensive assessment of cloud infrastructure reliability, the availability of flexible microservices, the measurement of accumulated technical debt, and a verification of cybersecurity policy resilience.

The third fundamental dimension encompasses Data Governance. It evaluates the organization's ability not only to store information but also to consolidate it into a unified structure (Master Data Management), employing machine learning to support data-driven decisions. The fourth criterion is customer-centricity, which assesses the architectural ability of systems to create a seamless and personalized experience across all available digital touchpoints. Finally, Interoperability is evaluated – the technical capacity of corporate systems to securely and rapidly exchange data via open APIs with commercial partners and government digital services (GovTech) *(Mihu C., Pitic A., Bayraktar D., 2023)*.

Theoretical perspectives on the role of information technology are best elucidated through an analysis of real-world corporate transformations, which demonstrate the long-term consequences of architectural decisions.

In the retail sector, the case of the former giant Sears serves as a cautionary tale – a classic victim of "technological myopia." The company attempted to implement fragmented digital elements without deep integration into a unified backend ERP system. This triggered massive data silos between departments, destroyed the possibility of creating a single omnichannel customer profile, and ultimately led to market collapse. Conversely, Walmart chose the uncompromising path of radical re-engineering. By implementing Agentic AI for autonomous inventory management, leveraging blockchain ledgers to ensure food supply chain security, and achieving deep algorithmic synchronization between online and offline store databases, Walmart successfully transformed into a high-tech IT enterprise.

In the financial sector, the neobank Monobank exemplifies an innovative "Digital Native" architectural paradigm. A total departure from traditional physical branches allowed the company to fundamentally restructure its costs and redirect freed-up resources toward building a powerful IT core. By utilizing in-app analytics for predictive data marketing and applying machine learning algorithms to build dynamic credit scoring (capable of analyzing even micro-patterns of smartphone interface interaction), the bank achieved unprecedented transaction processing speed and scalability through a flexible cloud infrastructure.

The experience of public administration is equally impressive, where the Ukrainian GovTech project "Diia" has become a global benchmark for implementing the "government-as-a-service" concept. Its architectural foundation is entirely based on the decentralized "Trembita" secure data exchange system (an analog of Estonia's X-

Road). This bus provides encrypted interoperability between isolated government registries via APIs, fundamentally avoiding the creation of a single, vulnerable "super-database" susceptible to massive cyberattacks. The flexibility of this IT infrastructure has enabled a transformation of the country's regulatory landscape (granting electronic passports equal legal status to physical ones) and ensured the ability to rapidly deploy critical security and social services under the conditions of a full-scale war.

Depending on the current state of a company's IT infrastructure, information technology can play vastly different roles. It can act as an enabler (a reliable toolkit for implementing an already established strategy), a powerful driver (when a technological breakthrough dictates a shift in the business model of an entire industry), or a significant barrier, where years of accumulated technical debt and monolithic systems completely block the integration of innovations.

A deep analysis allows us to formulate five key strategic imperatives for modern management and IT leaders:

1. Architectural Clarity (Conceptual Clarity): Executives must clearly distinguish between the technical processes of digitizing data, the algorithmic digitalization of workflows, and the comprehensive digital transformation of business models. Any attempt to "skip" the foundational infrastructure stage is guaranteed to lead to integration failure.

2. Sociotechnical Balance (Human-Centric Design): Successful transformation is a system where technology is subordinate to the processes of changing organizational culture, systematically overcoming personnel resistance, and developing a corporate Agile mindset.

3. Infrastructure Agility (Agility): To ensure long-term business viability, a company's IT architecture must be designed exclusively on the principles of microservices and open APIs, which guarantee high adaptability and the capacity for continuous innovation deployment.

4. Data as a Fundamental Asset (Data Fabric): Normalized, cleaned, and consolidated data is the enterprise's primary foundation. Without it, the implementation

of artificial intelligence algorithms is doomed to multiply systemic errors and false forecasts.

5. Ecosystem Paradigm (Platform Economy): The future of global business lies in the platform economy, where progressive companies design their IT systems not as closed fortresses, but as open ecosystems that interact transparently and securely with partners and the state via reliable digital gateways.

Passive observation of these rapid technological trends inevitably leads to the accumulation of fatal technical debt, whereas proactive, conscious integration of cutting-edge information technologies ensures sustainable economic growth, operational resilience, and a competitive advantage in the digital age.

1.2 The Architecture of the European Digital Decade: Infrastructural Dimensions, Regulatory Landscape, and "Twin Transition" Technologies.

The global digital economy is in a state of continuous turbulence, dominated by U.S. technology corporations and Asian hardware manufacturing capacities. The COVID-19 pandemic and the disruption of global supply chains have acted as catalysts, highlighting the critical vulnerability of European IT infrastructure. The European Union's response to these challenges has been a transition from the abstract concept of a "Digital Single Market" to the rigorously structured "Digital Decade 2030" strategy. This paradigm shift is based on the concept of "open strategic autonomy" and technological sovereignty, fundamentally altering the rules for designing, deploying, and operating information systems for the entire European continent *(Szczepański M., 2025)*.

For IT professionals, systems architects, and digital transformation managers, the European vector implies not merely a change in political declarations, but the implementation of new, mandatory architectural standards. Modern software and hardware complexes developed or deployed within the EU (and, consequently, in Ukraine, which is in the process of European integration) must comply with stringent requirements regarding interoperability, cybersecurity, data localization, and environmental sustainability.

The purpose of this section is to provide a comprehensive analysis of the EU's infrastructural and regulatory framework, which directly influences the development of enterprise IT architectures.

The "Digital Decade" program structures infrastructure development around specific, measurable technological metrics. For the IT sector, the most critical focus is the development of secure and high-performance digital infrastructure, as cloud services, artificial intelligence, and big data cannot function without the appropriate hardware foundation.

The European infrastructure strategy is based on three technological pillars *(Sadoian L., Sen K., 2025)*:

- Transition to 5G Standalone (SA) and Gigabit Networks: The goal implies not just expanding coverage, but a qualitative transition from Non-Standalone networks (which use a 5G radio interface but rely on an legacy 4G/LTE core) to "pure" 5G SA (Standalone Architecture). For enterprise IT systems, this is critical, as only SA architecture can provide Ultra-Reliable Low-Latency Communication (URLLC) and Massive Machine Type Communications (mMTC). Without this, the deployment of full-scale real-time industrial digital twins or autonomous industrial robotics is impossible.
- Edge Computing: The European vision entails the deployment of over 10,000 climate-neutral edge nodes by 2030. This fundamentally changes the paradigm of classic cloud computing. Instead of transmitting petabytes of raw data from IoT sensors to centralized data centers (which overloads the network and creates latency), data processing and the execution of ML models will occur locally, directly at the "edge" of the network. This significantly enhances cybersecurity (as data does not leave the enterprise perimeter) and the response speed of autonomous systems.
- Hardware Independence (Chips Act): Overcoming reliance on microprocessor imports by doubling the EU's share in global semiconductor production. The development of this infrastructure is a mandatory prerequisite for supporting the growing computational needs of Large Language Models (LLMs) and

for the implementation of next-generation cryptography (Post-Quantum Cryptography) in financial and government registries.

One of the most powerful tools of EU influence on the global IT market is the so-called "Brussels Effect" – the ability to export its regulatory standards to the global level. A modern IT architect can no longer design systems in a vacuum; database and information flow architectures must be developed according to the principles of "Privacy by Design" and "Security by Design".

In addition to the basic GDPR regulation, which has already changed approaches to managing relational databases, the new European "Digital Rulebook" includes three revolutionary legislative acts that directly dictate technological requirements *(OECD, 2026)*:

- Data Act: This regulation fundamentally changes the architecture of Internet of Things (IoT) solutions and cloud services. Historically, telemetry data generated by industrial equipment (e.g., turbines or tractors) was locked by manufacturers in proprietary formats (Vendor Lock-in). The Data Act legally obliges manufacturers to create Open APIs so that equipment owners can easily transfer this data to independent analytical systems or repair services. Furthermore, the act strictly limits "egress fees" charged by cloud providers, which encourages developers to move from single-cloud architectures to more resilient multi-cloud ecosystems.
- AI Act: This establishes the world's first strict risk-based approach to algorithms. If a company develops an AI-based IT system classified as "high-risk" (e.g., medical software, biometric identification, or HR recruitment algorithms), it must implement complex MLOps pipelines. The law requires perfectly documented datasets (free from bias), the implementation of "Explainable AI" systems (capable of explaining their decisions), and the guarantee of an architectural "Human-in-the-loop" mechanism that allows an operator to take control of the algorithm at any moment.
- DSA and DMA (Digital Services Act and Digital Markets Act): These acts are aimed at systemic technology giants, or "Gatekeepers." They require technical interoperability from messengers (the ability for a user of one app to send an encrypted

message to a user of another) and prohibit marketplaces from engaging in algorithmic self-preferencing.

Despite powerful initiatives, Europe is witnessing a dangerous "two-speed" digitalization: a colossal gap in the adoption of advanced IT between large multinational corporations and small and medium-sized enterprises (SMEs). The response to this problem is the concept of the "Twin Transition," which postulates an inseparable link between deep digital transformation and environmental sustainability goals (the Green Deal). In this paradigm, information technology is seen not merely as a tool for cost optimization, but as the only possible mechanism for monitoring carbon footprints and building a circular economy.

Key IT tools that ensure the implementation of the Twin Transition include *(DIGITALEUROPE, 2025)*:

– Digital Product Passport (DPP): This is a standardized electronic record (accessible via QR code, NFC, or RFID tag) that contains an exhaustive array of data regarding the entire product lifecycle: origin of materials, production energy intensity, repair instructions, and disposal methods. From an architectural perspective, the implementation of DPP requires enterprises to adopt distributed ledger technologies (Blockchain / DLT) to ensure data immutability and to build secure APIs for sharing this information across the entire supply chain.

– Digital Twins: The use of complex mathematical models and virtual replicas of physical objects for predictive simulation. For instance, in construction or the agro-industrial sector, IoT sensors transmit information in real-time to a cloud-based digital twin, which optimizes electricity or water consumption using machine learning algorithms, allowing environmental goals to be achieved through software-based methods alone.

To overcome the innovation barrier and bridge the technological gap among SMEs, the European strategy emphasizes the creation of a unified, interoperable support ecosystem, moving away from the practice of distributing ineffective, isolated grants.

The foundation of this architecture is the development of a network of European Digital Innovation Hubs (EDIHs). These are specialized technology hubs that provide local businesses with the critical "Test before Invest" service. SMEs gain access to high-performance computing clusters, cybersecurity laboratories, and AI Sandboxes, which allows them to test the integration of new software products into their business processes without incurring massive capital expenditures (CAPEX) for purchasing their own servers.

At the public administration level, a revolutionary IT project is the implementation of the Once-Only Technical System (OOTS). The OOTS architecture integrates national registries of the 27 European Union countries through secure data exchange gateways (similar to Ukraine's "Trembita" system). This allows businesses and citizens to avoid submitting the same official documents repeatedly; government systems of different states are able to independently request and receive necessary authorized data through encrypted communication channels, forming a true cross-border GovTech infrastructure.

A comprehensive analysis of the European Digital Decade architecture demonstrates that the EU's regulatory and infrastructure landscape shapes the most stringent yet simultaneously the most progressive requirements for corporate IT system development in the world.

Based on this analysis, five infrastructural imperatives can be identified for IT architects and digital transformation leaders:

1. Migration to an Open Ecosystem (API-First Design): Given the requirements of the Data Act, the era of closed, proprietary systems is coming to an end. All new IT solutions (from ERP to industrial scheduling systems) must be designed on an API-First principle, ensuring free and secure data export upon the client's request.
2. Transition to Edge Architectures: Centralized cloud monoliths are gradually losing efficiency in industry. Deployment strategies must focus on hybrid models where critical analytics and machine vision operate on peripheral servers (Edge Nodes) using private 5G networks.

3. Compliance with MLOps and AI Act principles: Artificial intelligence integration can no longer be chaotic. Algorithms require transparent, documented development pipelines (MLOps), continuous auditing of dataset bias, and the implementation of technical mechanisms for undeniable human oversight.

4. Implementation of IT for Sustainability (Green IT): Enterprises must adapt their IT infrastructure to support Digital Product Passports (DPP), which requires integration with distributed ledger technologies (DLT) and IoT for precise carbon footprint monitoring throughout the entire supply chain.

5. Multi-Cloud Resilience: To avoid infrastructural monopolism and ensure compliance with European cybersecurity directives, corporate architecture must be based on containerization (e.g., Kubernetes), which allows systems to migrate seamlessly between different cloud providers in the event of critical failures or cyberattacks.

1.3 Intelligent Automation Technologies: Hyperautomation, Process Mining, and Agentic Artificial Intelligence.

The development of corporate information systems has reached a threshold where traditional methods of algorithmic optimization of IT infrastructure have exhausted their potential. The simple replacement of paper-based document workflows with electronic versions, or point-based automation of isolated functions via scripts, no longer provides a competitive advantage. Modern corporate networks generate petabytes of unstructured data, while business processes span across dozens of isolated information systems, cloud applications, and external APIs. In response to the growing architectural entropy, the concept of hyperautomation has come to the forefront *(Rzepecka J., 2024)*.

From an engineering perspective, hyperautomation is not a standalone technology, but a strategic IT approach. It postulates that everything that can be technically automated must be automated through the orchestration of an ecosystem of diverse tools. This ecosystem integrates Business Process Management (BPM) systems, Robotic Process Automation (RPA) technologies, Process Mining, and artificial intelligence (AI/ML) platforms into a single continuous pipeline. The purpose of this chapter is to conduct an in-depth analysis of the architectural components of intelligent automation and their impact on the reengineering of the digital enterprise.

The first historical step toward liberating human capital from routine operations was Robotic Process Automation (RPA) technology. Classic RPA operates primarily at the User Interface (UI) level, where software robots imitate human actions – such as mouse movements and keystrokes – by executing hard-coded, linear, rule-based scripts. The primary architectural advantage of RPA is its capability for rapid deployment without interfering with the backend of legacy systems. For instance, a bot is capable of extracting data from an Excel spreadsheet and entering it into an old ERP module written in COBOL that lacks modern APIs entirely. However, this approach carries a critical flaw: fragility. The slightest change in a webpage's HTML code, a UI update, or a deviation in the input data format leads to immediate bot failure and the stoppage of the entire process *(Rzepecka J., 2024)*.

The current stage of technological evolution is characterized by a transition from rigid scripts to the paradigm of Agentic AI within the framework of Intelligent Process Automation. Unlike predictive or basic generative models, agentic IT systems possess the capacity for autonomous reasoning, the ability to decompose complex non-linear tasks, and the potential to formulate dynamic action plans.

Agentic AI architecture enables systems to recover from failures autonomously through self-healing processes. For example, in an integrated logistics management system, an AI agent does not merely send an alert regarding a cargo delay caused by weather conditions. The algorithm is capable of independently generating requests to the APIs of alternative suppliers, optimizing a new route using graph analytics, initiating a procurement transaction, and updating relevant statuses within an ERP system without any operator intervention. This signifies a fundamental transition from the automation of "manual labor" to the automation of "decision-making."

The foundation for the successful implementation of hyperautomation is Process Mining technology. Attempts to automate a chaotic, undocumented business process lead only to the automation of chaos. Process Mining addresses this issue, acting as an X-ray for corporate IT architecture. It is a class of analytical solutions that enables the reconstruction of real, actual ("as-is") business process models based exclusively on digital traces (event logs) left by users or systems within transactional databases (ERP, CRM, ITSM) *(Rzepecka J., 2024; Balkan N., 2022)*.

The engineering logic of Process Mining is based on the analysis of log files, each containing at least three mandatory attributes: a unique entity identifier (Case ID), an activity name (Activity), and an exact timestamp (Timestamp). By applying specialized algorithms (e.g., the Alpha algorithm, Heuristics Miner, or Inductive Miner), the system automatically synthesizes a visual directed process graph from millions of lines of unstructured logs. This allows IT auditors to detect hidden "bottlenecks," unauthorized workarounds, and deviations from the perfectly designed scenario ("happy path").

Today, a cutting-edge innovation is emerging in this field – Object-Centric Process Mining (OCPM), popularized by European developers, most notably the company Celonis. Traditional mining was limited to one-dimensional analysis (e.g., the system could track only the path of a specific order). OCPM technology utilizes relational databases for simultaneous, multi-dimensional modeling of complex many-to-many relationships. It is capable of simultaneously analyzing how a single order relates to multiple invoices, dozens of line items, and various logistics routes. The implementation of OCPM is a critically important step for overcoming information entropy in complex global supply chains where dozens of independent IT systems interact.

Hyperautomation achieves its highest efficiency in the manufacturing sector, where a convergence of traditional corporate Information Technologies (IT, such as ERP) and Operational Technologies (OT, such as SCADA systems and Programmable Logic Controllers – PLC) takes place. The concept of Industry 4.0 demands the dismantling of the architectural wall between office servers and factory floors.

A central element of this synergy is Digital Twin technology – a complete, synchronized virtual replica of physical equipment or an entire production line *(Burinskienė A., Nalivaikė J., 2024)*. When combined with Edge Computing, where machine vision models analyze video streams directly on assembly line servers, digital twins enable the implementation of the closed-loop analytics concept. Sensor data is not merely archived for historical reports; it is instantly processed by artificial intelligence, which generates control commands and transmits them back to robot controllers with millisecond latency, ensuring automatic self-adjustment of production in real-time.

The effectiveness of hyperautomation and Process Mining tools is best illustrated through the analysis of successful corporate case studies across various economic sectors, demonstrating the transition from manual labor to intelligent pipelines *(Automation Edge, 2026)*.

In high-tech manufacturing, a benchmark example is the Siemens Electronics Works (EWA) plant in Amberg, Germany. The company's architects created a 100% digital twin of the factory, enabling the simulation of circuit board production even before the physical launch of the production line. The implementation of machine vision algorithms (Edge AI) for the analysis of X-ray images of solder joints directly on the assembly line allowed for the creation of a closed-loop feedback mechanism with the Manufacturing Execution System (MES). As a result, the plant achieved an unprecedented quality level of 99.9988%, reducing scrap costs by millions of euros *(Misheva G., 2024; Yee L., Chui M., Roberts R., Smit S., 2025)*.

In the telecommunications sector, the global operator Vodafone integrated generative artificial intelligence solutions into its network maintenance infrastructure. The created "Field Technician Assist" system analyzes historical incident databases and current equipment telemetry. When a field engineer arrives at a base station, the AI instantly generates the most likely repair scenarios, which has reduced the number of repeat visits by 28%. Simultaneously, in Vodafone's back offices, thousands of RPA bots have automated transactions between billing systems and CRM, saving the company over a million hours of routine work.

The aviation and logistics sector also demonstrates successful AI integration. The airline Finnair applied a hybrid IT architecture in customer support: a deployed Suggestion Engine generates response options in various languages based on the query context in milliseconds, after which the operator merely approves the algorithmic solution. This reduced back-office response time by 46%. In turn, the spare parts distributor Euro Car Parts resolved the issue of "shadow IT" (where managers communicated with clients via personal phones) by integrating the official corporate WhatsApp API into a cloud-based bus. This allowed for the application of NLP algorithms for automated order routing and the generation of cross-sell recommendations directly within the client's messenger.

The analysis of the evolution of automation technologies confirms a fundamental transition from rigid algorithm programming to the implementation of self-learning, agentic IT systems. Modern enterprise architecture requires not merely the optimization of individual functions, but the construction of an end-to-end digital pipeline, where data circulates seamlessly between operational technologies, cloud applications, and AI algorithms.

Based on the analysis performed, five strategic imperatives for designing intelligent management systems have been formulated:

1. The Process Mining Imperative as a Zero Stage: Any large-scale automation project (RPA implementation or ERP upgrade) must non-alternatively begin with instrumental process log analysis (Process Mining). Blind automation based on subjective personnel interviews only leads to the scaling of architectural errors.
2. Transition to Multi-dimensional Analytics (OCPM): Given the complexity of the ecosystem, corporations must design their databases incorporating the Object-Centric Process Mining concept, which allows AI to analyze interrelationships between hundreds of different entities (from invoices to containers) within a unified relational space.

3. Replacing Rigid Scripts with Agentic AI: IT directors should plan a gradual migration from classic RPA bots relying on UI parsing to autonomous AI agents that interact with systems exclusively through stable, versioned APIs.

4. IT and OT Convergence via Edge Computing: In the manufacturing sector, the architectural wall between office servers and industrial equipment must be dismantled. Computational power should be deployed at the edge, ensuring millisecond latency for the operation of digital twins.

5. Human-in-the-Loop Architecture: When designing autonomous decision-making systems, IT architects are obligated to incorporate robust mechanisms for human oversight. System interfaces must ensure the transparency of algorithmic conclusions (Explainable AI) and provide the operator with the ability to instantly override control in the event of anomalies.

2. Infrastructure and Architecture of Enterprise Management Systems.

Modern enterprises operate amidst continuous transaction flows, where the speed and accuracy of data processing determine market viability. Siloed information systems serving separate departments inevitably generate information entropy, manifesting as data duplication, discrepancies in financial reports, and critical delays in supply chains. Enterprise Resource Planning (ERP) systems and integrated Electronic Document Management Systems (EDMS) occupy a central position in overcoming this fragmentation and building resilient digital architecture.

From an engineering perspective, ERP and EDMS are no longer viewed merely as "accounting software." Instead, they form the organization's unified, robust "Digital Backbone". This section provides a comprehensive architectural analysis of the evolution of management systems, explores methodologies for migrating from legacy platforms to modern cloud-based solutions, and examines technologies for the seamless integration of corporate systems via software interfaces and message brokers *(Khapekar S., 2024)*.

At its architectural core, an ERP system is a comprehensive, scalable software environment based on a centralized relational (or In-Memory) database, which eliminates the problem of "data silos" and ensures a "Single Source of Truth" across all departments. Historically, the architecture of such systems evolved from heavy, monolithic On-Premise solutions (where all code and data resided on a single physical enterprise server) toward Service-Oriented Architectures (SOA) and modern microservices-based Cloud-native architectures.

The modular structure of modern ERP cores allows businesses to flexibly configure and deploy only the necessary functional blocks. The financial module acts as the algorithmic "heart" of the system: it accumulates transactional trails from all departments, monitors global cash flow, and automatically generates the General Ledger. Warehouse and logistics modules (WMS/SCM) implement mathematically complex inventory accounting algorithms (FIFO, FEFO) and integrate tightly at the hardware level with Internet of Things (IoT) infrastructure (such as barcode scanners, RFID portals, and IoT gateways). Production modules (MRP/MES) synchronize multilevel Bills of Materials (BOM), optimize technological routings, and plan resource loading, technically enabling the implementation of the Just-in-Time (JIT) logistics paradigm. Simultaneously, Human Resource Management (HRM) modules handle complex computational models for time tracking and payroll processing, while CRM systems ensure continuous digital customer support *(Fortune Business Insights, 2025; Мазур Г., Макогонов А., 2025; Oracle, 2026; Паталяк Є., 2025)*.

The corporate software IT landscape in Ukraine is currently undergoing an active, existentially driven transition. Domestic businesses have faced an urgent necessity to completely abandon legacy management systems developed in the aggressor state (specifically the 1C platform). This process extends far beyond a simple change of software provider; it is a matter of fundamental cybersecurity and enterprise survival.

An analysis of the architecture of these legacy systems (1C) reveals a number of critical technological vulnerabilities. First and foremost, these are closed, obsolete platforms that do not meet modern international cryptographic protocols and security standards. This creates a high risk of hidden backdoors, rendering the infrastructure of

Ukrainian companies an ideal target for targeted cyberattacks (Advanced Persistent Threats – APTs). The second issue is deep technological stagnation: the monolithic structure of these platforms hinders their proper containerization (e.g., using Docker/Kubernetes), complicates deployment in modern scalable cloud environments (AWS, Microsoft Azure), and effectively precludes the native integration of powerful machine learning libraries for predictive analytics. Beyond engineering obstacles, companies face legal pressure: legislative initiatives provide for severe sanctions, including significant turnover-based fines for the use of prohibited sanctioned software, which turns migration into an absolute compliance imperative.

The transition methodology plays a decisive role in the success of the transformation. Database engineers strongly advise against attempts to directly and automatically transfer data from an old database to a new ERP, as this inevitably leads to the migration of historical data residue and duplicates. The architecturally correct approach is to apply the ETL (Extract, Transform, Load) methodology *(IT.ua, 2026)*. This pipeline involves exporting raw data into intermediate formats (CSV, XML, JSON), conducting deep algorithmic cleaning (Data Cleansing), normalizing counterparty and nomenclature directories, and only then performing a secure load into the new relational structure of the modern ERP core.

The market offers several robust migration vectors, each of which relies on distinct architectural concepts and technology stacks. The selection of a specific platform depends on the organization's level of digital maturity and its readiness to invest in its internal IT infrastructure.

The global enterprise segment encompasses flagship products from multinational corporations. A prominent representative is SAP S/4HANA, a system that has established the global standard for big data processing by utilizing a proprietary In-Memory database, where information is processed directly in the server's RAM, ensuring zero-latency transactions. Another leader is Microsoft Dynamics 365, built on a cloud-native architecture that is deeply integrated with Azure infrastructure, AI algorithms (Copilot), and graph APIs (Microsoft Graph). However, deploying such systems requires substantial budgets and the engagement of international integrators.

The national development market is represented by robust Ukrainian ecosystems. The IT-Enterprise platform is positioned as a flagship solution for medium and large-scale industrial enterprises *(IT.ua, 2026; Попович Л., 2025)*. Its architecture is distinguished by the presence of over 45 built-in artificial intelligence agents, full support for microservices, and strict compliance with the international information security standard ISO 27001. For the small and medium-sized enterprise (SME) segment, the SaaS solution MASTER:Buhhalteriya has been developed, ensuring a low entry barrier and focusing on technical and legislative compatibility with Ukraine's tax APIs *(MasterBuh, 2025)*.

A separate, strategically important vector is the use of open-source systems, with Odoo emerging as a leader *(Todo, 2026)*. The platform is written in the Python programming language and utilizes the powerful object-relational DBMS PostgreSQL. Odoo's open modular architecture allows a company's in-house developers to gain full access to the system core, deeply customize process logic to meet unique business needs, and, most importantly, avoid dangerous technological reliance on a single vendor (Vendor Lock-in).

A technological comparison of the leading ERP system architectures is summarized in Table 2.

Table 2

Technological comparison of leading ERP system architectures

Characteristic	SAP S/4HANA	Microsoft Dynamics 365	IT-Enterprise	MASTER: Accounting	Odoo
Target segment	Large corporations (Enterprise)	Large and medium-sized businesses	Industry, Big Business	SMEs, budgetary institutions	SME, E-commerce, Manufacturing
Architecture / Database	In-Memory (SAP HANA)	Cloud-native (Azure SQL)	Microservices, AI-native	Cloud (SaaS) / Local	Open-Source (Python/PostgreSQL)
Deployment model	On-Premise / Cloud	Mostly SaaS	On-Premise / SaaS	SaaS	Community (Self-hosted) / Enterprise
Technological advantages	Big Data processing, high performance	Integration with AI Copilot, Azure	Availability of Agentic AI, ISO 27001 protection	API compatibility with DPS, quick start	Code flexibility, modularity, API-first
Integration protocols	BAPI, OData	REST API, Service Bus	SOAP, REST API	Direct banking integration	REST API, Webhooks, GraphQL

A full-fledged digital management framework cannot be built without Electronic Document Management (EDM) systems, which ensure the legal validity and immutability of every transaction. In the context of IT architecture, EDM is not merely an interface for exchanging PDF files, but a complex infrastructural system relying on robust cryptographic algorithms *(EDIN, 2025)*.

The foundation of electronic trust is the Qualified Electronic Signature (QES), the creation of which is based on asymmetric cryptography methods and Public Key Infrastructure (PKI). In this paradigm, a mathematically linked pair of keys (public and private) guarantees the authenticity and integrity of a document, making any undetected modification impossible after signing. Modern Ukrainian services (such as Vchasno, FlyDoc, M.E.Doc, and DEALS) are built in accordance with rigorous standards that are continuously harmonized with the European eIDAS regulation on electronic identification, ensuring cross-border interoperability *(Попович Л., 2025)*.

The technical evolution of EDM is moving towards cloud-based cryptographic storage (Cloud PKI), where a user's private key is generated and securely stored on hardware-protected provider servers. This allows a QES to be applied directly from a smartphone, eliminating reliance on vulnerable physical hardware tokens.

The paradigm of monolithic ERP systems, which attempt to encompass every enterprise function – from accounting to warehouse management – is gradually becoming a thing of the past. It has been superseded by the concept of the Composable Enterprise, which involves the use of highly specialized, best-of-breed microservices. To ensure these disparate modules (such as ERP, CRM, WMS, and EDM platforms) function as a unified digital organism, the construction of a robust integration architecture is critically necessary.

The primary protocol for interaction consists of Application Programming Interfaces (APIs), specifically the RESTful API architectural style. It facilitates the standardized exchange of structured data (typically in JSON or XML formats) via the HTTP internet protocol. For instance, instead of manual file uploads, an ERP system automatically generates a POST request to an EDM service API, transmitting the body of a service acceptance certificate; in response, it receives a unique document identifier (Hash ID) for subsequent automatic status monitoring through periodic GET requests or a Webhooks mechanism.

However, in large-scale corporate ecosystems where dozens of databases and applications interact simultaneously, direct point-to-point integration inevitably leads to the creation of unstable, unmanageable "spaghetti code." The solution to this architectural challenge is the deployment of an Enterprise Service Bus (ESB) or message brokers, such as Apache Kafka, RabbitMQ, or IBM App Connect. The ESB functions as the central nervous system of the enterprise: it accepts asynchronous messages from various microservices, automatically performs protocol and data format transformation, intelligently routes packets to the appropriate destinations, and guarantees delivery even in the event of temporary server downtime, thereby ensuring the fault tolerance of the entire management system.

The architectural analysis conducted confirms that modern ERP systems, combined with cryptographically secured electronic document management, form an indispensable digital foundation for the functioning of any resilient business. Technological stagnation on legacy platforms is no longer merely a matter of lost profit – it is a direct threat to the enterprise's cybernetic and legal security.

Based on this technical overview, five strategic imperatives for the design and integration of management systems have been formulated:

1. Emergency migration from Legacy systems: The abandonment of Russian software (1C/BAS) must be viewed by management as a priority cybersecurity project. Migration to modern platforms (SAP, IT-Enterprise, Odoo) is a critical prerequisite for integrating advanced analytics and AI tools.

2. Application of ETL methodology during transition: The database migration process must necessarily include a stage of algorithmic cleansing, deduplication, and data normalization. Direct database transfer is prohibited, as it preserves past architectural errors within the new system.

3. Priority of openness and API-First design: When selecting any corporate software, the primary technical criterion must be the availability of comprehensively documented open APIs. Closed-architecture systems that block data export are unacceptable in the modern ecosystem economy.

4. Implementation of data buses (ESB) for scaling: IT directors must transition from chaotic point-to-point integrations to the use of centralized message brokers (such as Apache Kafka), which ensures asynchronicity, reliability, and the independent scalability of each microservice.

5. Total cryptographic identification: EDM (Electronic Document Management) systems must evolve from simple document repositories into a unified gateway of trust, where every transaction, counterparty action, or database request is validated using a Qualified Electronic Signature (QES) or PKI infrastructure.

3. Prospects for the Development of Ecosystems and Intelligent Management Technologies.

The evolution of information technology has reached a critical threshold where the automation of individual functions within a single organization no longer ensures exponential efficiency growth. The modern management paradigm is shifting its focus from creating isolated corporate IT "fortresses" toward the development of open, integrated digital ecosystems. The future of corporate architecture belongs to systems capable of real-time, seamless, and secure data exchange with external counterparties, financial institutions, and government registries.

Simultaneously, a fundamental shift in artificial intelligence (AI) is being observed: these technologies are definitively moving from the realm of laboratory experiments and conceptual prototypes into the sphere of practical industrial application. The purpose of this chapter is to provide a comprehensive analysis of the key technological trends that will shape digital business architecture up to 2030, with a particular focus on the API economy, the democratization of IT development, and the evolution of autonomous AI systems.

The foundation of the modern ecosystem approach is the concept of Open Architecture, based on the pervasive use of Application Programming Interfaces (APIs). Enterprise information systems (specifically ERP and CRM) are no longer designed as closed databases; instead, they are transforming into nodes of a global network that interact with one another via standardized protocols, forming what is known as the API economy *(Мазур Г., Макогонов А., 2025; Попович Л., 2025)*.

This trend is most vividly manifested in the financial sector through the implementation of the Open Banking directive (PSD2 in Europe). Thanks to open banking APIs, a modern ERP system can directly initiate payments, verify balances, and automatically reconcile bank statements in the General Ledger without relying on third-party client-banking applications. This eliminates a significant layer of routine manual work and reduces the latency of financial operations to milliseconds.

Equally important is the deep integration of corporate systems with government digital services (GovTech). Due to the development of state interoperable platforms (such as the Ukrainian "Trembita" system), businesses gain the ability to configure a direct API Gateway for interaction with state registries. This allows an ERP system to automatically verify a counterparty's tax status in real-time, check for licenses, update company registration data, and perform automatic fiscalization of electronic receipts on tax service servers. Such B2G (Business-to-Government) integration fundamentally alters the compliance architecture, transforming it from a manual bureaucratic process into an invisible background algorithm.

While the previous decade was defined by machine learning algorithms capable of demand forecasting (Predictive AI), and recent years have been marked by a proliferation of systems generating text and code (Generative AI), the next stage of corporate IT evolution is inextricably linked to the deployment of Agentic AI.

Agentic systems differ conceptually from traditional neural networks in that they are endowed with a level of algorithmic autonomy sufficient for independent managerial decision-making and the execution of multi-stage actions in physical or digital environments. From an architectural perspective, such an AI agent is integrated directly into the core of an ERP system, gaining access to historical data, authorization to change document statuses, and access tokens for external supplier APIs. Unlike rigidly programmed RPA bots, Agentic AI is capable of adapting to unpredictable changes: when encountering a supply chain disruption, it independently decomposes the problem, formulates an alternative procurement strategy, conducts automatic bidding with suppliers on electronic platforms, and reroutes logistics.

The implementation of such systems radically changes the human role in business processes: the operational paradigm shifts from "doing work" to "managing algorithms," thereby freeing up human capital for exclusively creative and strategic tasks.

A critical problem in the modern technology market is the global shortage of highly qualified software engineers, which creates a "bottleneck" in corporate development processes. The traditional Software Development Life Cycle (SDLC) is too slow for the conditions of an exponentially changing market. The architectural response to this challenge has been the rapid proliferation of Low-Code and No-Code (LCNC) platforms, which have initiated a trend toward the large-scale democratization of information technology.

From a technical standpoint, LCNC platforms represent visual development environments integrated with generative AI. They allow so-called "citizen developers" – business analysts, product managers, or marketers who lack formal programming language skills – to independently design application interfaces, configure document routing, and create complex API integrations using drag-and-drop mechanics. Complex backend code, including databases, authentication, and cloud scaling, is generated automatically by the platform. This architectural paradigm radically reduces Time-to-Market, allowing traditional IT departments to focus on the strategic tasks of infrastructural security and Data Governance.

The evolution of the enterprise infrastructure core in the coming years will be defined by the transition from centralized Public Cloud models to Distributed Cloud and Edge Computing. Classic cloud architecture, where all data is transmitted for processing to remote mega-datacenters, is becoming inefficient for Industry 4.0 enterprises due to high latency and backbone network congestion. Distributed cloud allows for physically placing computing nodes closer to the data generation source (for example, directly on the production floor or in a retail store) while retaining centralized service management with the cloud provider.

Concurrently, amidst intense geopolitical confrontation and increasing regulatory requirements (notably the European GDPR), the concept of Sovereign Cloud is gaining critical importance. This architectural approach guarantees that all enterprise data is stored and processed exclusively within a specific jurisdiction, making access to these data arrays by foreign governments or foreign provider administrators technologically and legally impossible. For the Ukrainian corporate and public sectors, especially under martial law and cyberwarfare conditions, the development of hybrid and sovereign cloud landscapes has become a fundamental issue of national security.

The global information technology landscape has approached a singularity point, where disparate innovations (AI, open APIs, cloud microservices) converge into a single flow, permanently altering the architecture of business conduct. Companies that continue to perceive IT merely as auxiliary infrastructure for accounting automation will inevitably lose their market position under the pressure of autonomous digital ecosystems.

Based on the analysis of key technological trends up to 2030, five fundamental strategic imperatives for designing future corporate architectures can be identified:

1. Ecosystem Openness (API-Driven Architecture): IT development strategy must be built on the principle of openness. All internal enterprise services must be designed as a set of secure microservices with open APIs, enabling instant integration with banks (Open Banking), counterparties, and state GovTech registries.

2. Transition to Autonomous Management (Agentic AI): Management must initiate the development of an implementation strategy for Agentic AI, shifting from reactive analytics to proactive systems capable of autonomously making routine operational decisions in real-time, while maintaining a reliable architectural mechanism for human oversight.

3. Democratization of Development (LCNC): To overcome the IT talent gap, companies must invest in the deployment of internal Low-Code/No-Code platforms, while simultaneously establishing strict cybersecurity frameworks (Centers of Excellence) to prevent the chaotic proliferation of unmanaged "Shadow IT."

4. Infrastructure Resilience and Decentralization: Data storage and processing architecture must shift to hybrid, distributed models (Distributed Cloud) with active utilization of Edge Computing, which will guarantee zero latency for production processes and resilience against global network outages.

5. Zero Trust as a Security Standard: In the era of open ecosystems and integration with thousands of external algorithms, classic perimeter network security

loses its relevance. The foundation of security must be Zero Trust architecture, where every micro-transaction, every device, and every API request undergoes rigorous cryptographic authentication, regardless of whether they are inside or outside the corporate network.

Conclusions and suggestions. The comprehensive analysis of the structure of digital transformations conducted in this article allows us to assert that modern information technologies have definitively moved beyond the supportive infrastructural function, transforming into a fundamental driver of global competitiveness and organizational survival. The technical digitization of information serves merely as the initial stage – the creation of a raw database – whereas true digital transformation requires the deconstruction of monolithic corporate systems, the construction of agile microservice architectures, and a profound shift in organizational culture. It is proven that the success of any technological project is impossible without maintaining a sociotechnical balance, where the implementation of innovation is necessarily accompanied by overcoming corporate resistance, developing digital leadership, and fostering an Agile mindset among personnel.

The European trajectory of development dictates fundamentally new rules for designing IT systems. An analysis of the "Digital Decade 2030" policy and the latest EU regulatory landscape (Data Act, AI Act, GDPR) testifies to a transition toward an open data management ecosystem. For domestic business, this implies the necessity of designing systems based on the API-First principle, ensuring strict transparency of machine learning algorithms (MLOps), and implementing technologies to support environmental sustainability within the framework of the "Twin Transition" concept.

In the operational dimension, this monograph records the inevitability of the transition from classic methods of algorithmic optimization to the concept of hyperautomation. Replacing hard-coded RPA scenarios with adaptive Agentic AI systems allows organizations to delegate not just routine labor, but multi-stage decision-making processes to algorithms. The foundation for such reengineering is identified as Process Mining technology, particularly object-centric models (OCPM), which provide an objective "X-ray" of complex supply chains and allow for the elimination of information entropy even before automation begins.

For the Ukrainian corporate sector, the current historical stage is characterized by the critical imperative of completely abandoning legacy Russian accounting systems (1C/BAS). The forced migration to modern global (SAP, Microsoft) or national (IT-Enterprise, MASTER) cloud platforms and open-source systems (Odoo) is not only a matter of cybersecurity and legislative compliance, but also a unique window of opportunity for a technological leap. Only the tight integration of modern ERP cores, legally significant electronic document management (EDM), and enterprise service buses (ESB) can form a resilient and flexible digital contour for an enterprise.

In summary, the future of global business inevitably lies within the sphere of the platform economy. Isolated "fortress" companies will inevitably give way to open digital ecosystems that interact transparently and instantly with banks, counterparties, and the state (GovTech) through secure digital gateways based on a Zero Trust architecture. Passive observation of the exponential development of these technologies leads to the accumulation of fatal technical debt, whereas proactive and strategically calibrated IT integration opens new horizons of productivity for enterprises amidst the complexities of the digital age.

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