Modern information technologies improving enterprise management. Examples from the TSL sector

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Abstract

Effective management of contemporary enterprises requires use of information technologies. They respond to the challenges of globalisation and intense competition. This article examines the role of IT in ensuring smooth operations and sustainable growth, with particular reference to the transport, shipping and logistics (TSL) sector. Its aim is to present modern information technologies and to assess their significance for the functioning and sustainable development of enterprises, with a specific focus on TSL. The paper discusses core IT systems (e.g. ERP, CRM, RPA and Business Intelligence) that support process integration, task automation and decision-making. It also considers specialist supply-chain tools, including WMS, TMS and RFID. These tools optimise warehouse and transport processes. Later sections introduce emerging trends such as digital twins and edge AI. They explain what these trends mean for the future of logistics. The analysis also underlines the need for efficient wireless communications, notably 5G, to make such solutions work in practice. Information technologies play a major role in supporting sustainable development aligned with the ESG standard. Technology has become a driving force that enables enterprises to realise economic, environmental and social benefits.

Key words

information technologies, management, sustainable development, transport, shipping and logistics (TSL) sector, logistics

Introduction

In today's fast-moving business world, effective management of a logistics enterprise is crucial to success. Supply chain management is its foundation. With rising competition, market globalisation and ever higher customer expectations, traditional methods are no longer enough.

In this context, modern information technologies become more than mere support. They form the bedrock of contemporary logistics. Logistics now entails comprehensive management of the entire supply chain, which is increasingly dispersed and global. It serves to enrich the market offering for the entity served, whether a product or a service [Ficoń & Krasnodębski, 2018, p. 78].

The deployment of advanced information systems enables levels of process optimisation that were previously out of reach. It also lifts operational efficiency. Contemporary enterprises recognise that innovative, integrated information systems play a very important role in management and development. Without them, proper functioning is not possible [Rut & Kulińska, 2015, p. 5559]. Firms face exacting demands regarding the speed, effectiveness and accuracy of decision-making. To support these decision processes, appropriate IT tools are essential [Ziora, 2011, p. 120].

Against this backdrop, it is vital to examine how innovative IT solutions can influence business processes. The aim of the article is to present modern information technologies and their significance for the functioning and sustainable development of enterprises, with a particular focus on the TSL sector. The article also outlines the growing trends in innovative information systems. The analysis rests on a thorough review of the literature, including scholarly publications, monographs and current industry reports.

1. Information technologies – definition, functions and their significance in enterprise management

Contemporary enterprises, whatever the sector, operate in an environment of growing complexity, rapid change and global competition. These pressures demand a different response. Information technology (IT) is no longer merely supportive. It has become a strategic factor that determines operational efficiency and the capacity to innovate.

IT comprises methods, tools and processes used to collect, store, process, transmit and share information through computing devices, telecommunications networks and appropriate software [Mfiles, 2023]. The Polish Language Council de-

fines information technology as "ways of collecting, sending, analysing and receiving information using techniques for its processing" [RJP, 2021]. The definitions differ in detail but share a common core. Both point to comprehensive information management. In practice, this translates into several fundamental functions within the enterprise:

- information collection – the gathering of data from diverse sources for later processing and use. It is a basic stage in enterprise information management;
- information storage – writing data to durable media (magnetic, optical or electronic) in a form that can be readily used in subsequent processing. Current and archived information is also subject to operations such as compression or encryption [Grabińska, Pawełoszek & Ziora, 2020, p. 25];
- data processing – transforming raw inputs into useful outputs. Typical operations include classification, sorting, calculation, summarisation and presenting data in a form intelligible to users;
- data transmission – moving information from one point to another via physical media (e.g., cables) or wireless means (radio waves).

One of IT's most important roles in enterprise management is to support decision-making. In most organisations, three management levels can be distinguished. Each involves different types of decisions [Mroczko & Stańkowska, 2006, pp. 338-339]:

- operational level – highly structured, routine and repetitive decisions. Because they are repetitive, they often involve few alternative courses of action;
- tactical (managerial) level – decisions are weakly structured and rest on judgement, experience and situational assessment. Their nature makes them difficult to codify within information systems;
- strategic level – the most demanding tier, marked by high uncertainty and a long time horizon, which entails significant risk;

Accordingly, IT supports decision processes by analysing complex datasets and modelling scenarios. This reduces uncertainty and strengthens choices that are pivotal to the firm's future.

IT is also crucial to competitiveness. It underpins effective management of information and knowledge, which are among a firm's most valuable assets. Knowledge management is not only the skilful use of existing knowledge. It also seeks a synergy effect. The aim is to combine resources into a coherent whole and obtain outcomes greater than their direct, separate use would yield [Kisielnicki, 2015, p. 26]. Achieving such synergy requires efficient communication and collaboration. IT provides the necessary support by enabling a smooth flow of information

within the organisation. Effective exchange of data and knowledge has a direct impact on process performance. Better communication should improve the functioning of the organisation as a whole and translate into stronger financial results (e.g., reduced material losses, time savings, fuller use of employee skills) [Zalewska-Turzyńska, 2017, p. 143].

In consequence, the effective implementation and integration of IT across all areas of the enterprise becomes a key condition for achieving strategic business goals. It is also essential for securing a durable competitive advantage.

2. Core information technologies used in enterprise management

Managing an enterprise in the face of ever-increasing competition requires more than intuition. It requires reliable data and tools to analyse it. Using core information technologies helps a firm keep pace with competitors. It also strengthens the position of the domestic company.

Below are the basic information technologies that are critical to the smooth running of modern organisations. Enterprise Resource Planning (ERP) systems integrate data from different areas of the firm, such as finance, sales, procurement, human resources and more [Ragin-Korecka et al., 2024, p. 29]. As Stępniak, Sobociński and Chluski (2020) note, ERP systems comprise modules aligned to the enterprise's key functional areas. The main ones include:

- financial and accounting modules – manage financial operations, including accounting, cash-flow control and asset records;
- operational modules – streamline day-to-day processes such as warehouse and procurement management, sales and invoicing, and production planning and control;
- human resources modules – automate personnel management, including HR, payroll and timekeeping;
- integrated architecture – such integration removes information silos. This raises efficiency across the whole organisation.

Supporting only internal processes is not enough. Building durable customer relationships is also essential, and specialised IT tools serve this goal. Customer Relationship Management (CRM) is a technology designed to identify and meet customer needs. It also supports relationship marketing by collecting and processing information [Czyszczoń & Zgrzywa, 2012, p. 135].

CRM architecture rests on two main structures that complement each other: operational CRM and analytical CRM. Operational CRM focuses on routine business functions such as invoicing, order management, and sales and marketing automation.

Analytical CRM manages the data warehouse. It stores records of customer contacts, personal data, and product and sales outcomes. Through integration with other internal systems, such as sales, logistics and purchasing, analytical CRM enables the identification and forecasting of consumer buying behaviour [Nyszk, 2019, p. 475].

Beyond these, CRM also includes systems for direct customer interaction. The literature refers to this as communication CRM, also called cooperative or interactive CRM. It maintains direct contact with customers using both traditional and modern communication technologies. It coordinates channels for customers, suppliers and business partners, including telemarketing, call centres, email and websites [Wyskwarski, 2015, p. 552]. These functions matter across the entire customer life cycle. They are especially important in post-sales service. In this area, CRM supports automatic handling of warranty services, post-warranty services and complaints [Halicka, 2010, p. 53].

Comprehensive support for business processes is a core aim of CRM. It brings several benefits to the enterprise, including [Nwabekee et al., 2024, p. 59]:

- Personalisation and better targeting of marketing activities by using customer data;
- Higher engagement and conversion through more relevant, personalised content;
- Improved customer service;
- Increased customer retention.

Modern information technologies also automate repetitive processes. This is the next step in optimising enterprise work. One such solution is Robotic Process Automation (RPA). RPA refers to programmed software robots that imitate and replace employees in repetitive, manual tasks [Radke, Dang & Tan, 2020, p. 130]. More specifically, a robot can log into applications and copy and paste data. It can extract and process structured or semi-structured content from documents. It can pull data from the internet and perform calculations.

Unlike traditional automation, RPA does not require extensive implementation changes. It can adapt to a wide range of application interfaces [Wanner et al., 2019, p. 3]. RPA blends related technologies such as autonomous systems, machine learning, artificial intelligence (AI) and robotics. These emerging technologies have shaped RPA solutions and now form their foundation [Kaya, Turkyilmaz & Birol, 2018, p. 237].

RPA is a key element of digital transformation. It delivers many benefits, including:

- higher productivity,
- improved task accuracy,

- lower labour costs,
- greater process scalability.

Implementing RPA automates repetitive tasks. This lets firms invest in higher value-added areas and create better jobs [Gómez Gandía et al., 2024]. There is no reason to fear that RPA will wholly replace people and eliminate jobs. In the long run, automating routine work allows firms to redeploy staff to more complex and creative activities.

Business analytics is also advancing. It is vital to modern organisations and supports decision-making. The literature offers many definitions of Business Intelligence (BI).

BI is an umbrella term for strategies, technologies and information systems. Firms use it to extract, along the value chain, important knowledge from large and heterogeneous datasets. This knowledge supports a wide range of operational, tactical and strategic business decisions [Muntean, 2018, p. 1]. A concise definition describes BI as the process of turning data into information and then into knowledge [Kunnathuvalappil Hariharan, 2018, p. 75]. The concept is not new and many companies have used it. It has grown in popularity because it now covers analytics, big data and artificial intelligence. These are integral to digital transformation. BI-driven decisions are valuable to organisations whose ultimate aim is to raise performance [Vugec et al., 2020, p. 1709].

Achieving these aims requires a clearly defined BI process. First, data are collected. They are then extracted, transformed and loaded (ETL) into a multidimensional database, typically a data warehouse [De Santa-Eulalia, Mosconi & Bordeleau, 2018, p. 3945]. The processed resources are analysed and presented. Presentation includes reports, interactive exploration tools and alerts. Operational graphical interfaces, known as dashboards, complete the set.

As data sources for business analytics evolve, the digitalisation of business processes introduces new, structured information streams. One example is the National e-Invoice System (KSeF). KSeF is an ICT system for sending, receiving and storing structured invoices [Pokrop & Pałys, 2022, p. 21]. Use of KSeF is currently voluntary, but mandatory rollout in Poland is planned for 2026. As a central platform, KSeF performs several key functions that directly affect a firm's analytics. The system will authenticate and verify invoices held by the taxpayer, receive them, and store them in a dedicated database for 10 years. It will also assign identification numbers, standardise invoices, and enable analysis and control [Szymanek, 2021, p. 43].

3. Information technologies used in the management of projects carried out in enterprises

Modern enterprises, seeking greater efficiency and competitiveness, increasingly use advanced information technologies for project management. Their role goes beyond simple planning. They also automate processes, support communication and provide the data needed for informed decisions. This approach aligns with agile methods, which emphasise flexibility and fast responses to market change. Agile project management focuses on work that adds value and removes unnecessary activities. These methods work best where uncertainty is high, full up-front planning is difficult and success depends on creativity and close cooperation within skilled teams [Strojny & Szmigiel, 2015, p. 254].

Many software tools support agile approaches. One of them is Microsoft Project. It is advanced project-management software that helps plan projects, track progress, collaborate and manage resources. It structures work and helps deliver on time and within budget [MicrosoftPr, 2025]. Microsoft Project enables detailed scheduling. It supports task definition, dependency setting and progress visualisation through Gantt charts. It also assists with resource management, which helps optimise the allocation of people, materials and finances while avoiding overloads. In addition, it supports budget control by tracking costs, monitoring spending in real time and producing financial reports.

Beyond Microsoft, organisations frequently use Atlassian Jira for agile delivery. Jira provides Scrum and Kanban boards, backlogs, roadmaps and custom workflows. It also offers powerful querying (JQL) and built-in automation. The key advantages are mature agile support, strong traceability from epics to tasks and broad integrations with development tools [AtlassianJira, 2025].

Collaboration-first platforms are also popular. Asana supplies boards and list views, a Timeline (Gantt-style) view, Portfolios and Workload for capacity balancing, plus rules-based automation. Smartsheet combines a spreadsheet-like grid with Gantt charts, dashboards and workflow automation, which shortens onboarding for non-technical teams. For lightweight Kanban, Trello uses boards, lists and cards with Butler no-code automation to remove repetitive steps. The benefits across these tools include quick adoption, visibility across functions and fewer coordination bottlenecks [Asana, 2025; Smartsheet, 2025; Trello, 2025].

However, even the best plans fail without effective team communication. Modern project management therefore relies on tools such as Microsoft Teams, which integrates collaboration processes. Microsoft Teams is a real-time communication and collaboration platform. It supports messaging, meetings, file sharing and access

to apps in a single, centralised workspace. The tool eases day-to-day interactions and provides open access to resources within the organisational structure [MicrosoftTs, 2025].

Sound project management also requires data processing to extract useful insights. Business Intelligence tools complement the project ecosystem. One example, integrated with Microsoft solutions, is Microsoft Power BI. It is a business-analytics platform that connects, visualises and shares data across the organisation. In doing so, it supports decision-making at different levels of the hierarchy [MicrosoftBi, 2025]. The strength of the Microsoft stack is its completeness and coherence. It lets teams manage projects end-to-end, from planning to analytics, on one platform. Deep integrations reduce manual data transfers and improve information flow, which raises team efficiency. The tools also provide strong data security and regulatory compliance (e.g., GDPR).

There are trade-offs. Full implementation entails significant costs, which may be a barrier for smaller organisations. Mastering the full feature set also takes time. The ecosystem's complexity demands specialist skills from users and administrators. There is a further risk of information overload and distraction if governance processes are weak.

4. Information technologies used in logistics processes

Logistics processes are an integral part of every enterprise. They now require efficient management of the flows of goods, information and funds. As market demands rise, traditional methods are no longer sufficient. Advanced information technologies therefore play a central role in optimising management. Their use expands the capabilities of a logistics enterprise.

To achieve this, organisations increasingly deploy integrated systems such as supply chain management (SCM) systems. SCM covers activities linked to the movement of resources, goods and information between all parties in the chain. Its aim is the continual improvement of these processes. This brings significant benefits to all stakeholders [Erceg & Damoska Sekuloska, 2019, p. 158]. In practice, SCM supports a set of practices designed to optimise all key processes in the enterprise, including:

- supply-chain integration – coordinating activities across internal departments and with suppliers and customers to improve the flow of information and resources.
- information sharing – giving partners real-time access to data. This increases transparency and speeds up decision-making.

- strategic partnerships: Building long-term relationships with key suppliers and customers to support joint development.
- outsourcing – handing selected logistics processes to external parties. This allows firms to focus on their core activities [Sukati, Ba Awain & Ismaeel, 2023, p. 4.].

A vital component of SCM is the effective management of internal logistics. Specialist subsystems support this area, with warehouse management systems (WMS) being the most common example. WMS software assists warehouse operations. It streamlines receiving and dispatch, internal movements and location allocation. It safeguards material integrity and security and supports the first-in, first-out (FIFO) principle. It also aids inventory control and other core logistics processes [Tong, Ming & Zhang, 2023, p. 5]. With WMS, goods are placed in optimal storage locations. This reduces human error and enables rapid response when problems arise. Implementation, however, requires careful planning and coordination. Integration with other IT systems and staff training often pose challenges.

WMS also integrates with technologies that automate order picking. Pick-by-Light uses illuminated panels and a digital display to guide the operator to the exact location and quantity. After picking, the employee confirms completion by pressing a button. The confirmation is sent automatically to the WMS. This increases picking speed and removes the need for paper documentation [Matyszkiewicz, 2024, p. 275]. Pick-by-Voice relies on voice communication between the worker and the system. The picker wears a wireless headset connected to a belt-mounted terminal. The system provides location and quantity instructions via the headset. The operator confirms completion by speaking a control code and the number of items picked. Hands remain free, which raises efficiency and reduces errors [Kuczyński, Obernikhin & Żyła, 2024, p. 123].

Radio-based technologies play a similar role in boosting process efficiency. RFID (Radio Frequency Identification) uses radio waves to transmit data wirelessly. It is widely used in identification systems and in various Internet of Things (IoT) applications [Hubacz et al., 2025, p. 61; Guzowski et al, 2024]. A basic RFID deployment is straightforward. Complexity grows when it must integrate with existing infrastructure and handle high data volumes. A typical system comprises two elements: a reader/writer device (RWD) and a tag. The RWD has at least one antenna; the tag contains its own antenna, a microprocessor and memory. The memory stores data such as the tag's serial number and object information [Pawłowicz et al., 2025, p. 68]. This design enables wireless data transfer and greatly improves object identification. RFID is closely integrated with WMS, allowing automated verification of inbound and outbound flows.

RFID tags come in several types. Passive tags have no internal power source. They draw energy from the reader's radio waves. Their range is shorter, but they are cheaper and smaller, which suits item-level tagging. Active tags have their own battery. They offer a much longer read range and continuous signal transmission [RFID, 2022]. They cost more and are larger, but they are ideal for valuable assets such as containers and pallets. RFID can also monitor stock levels automatically without scanning each item. Inventories are faster and more accurate, and the typical errors of manual counts and barcodes are reduced.

Accurate warehouse data feed the next link in the chain: transport. Planning and execution are handled by a transport management system (TMS). A TMS is a specialised software platform that supports and optimises the physical movement of goods. It covers planning, execution and control, regardless of mode, road, rail, air or sea [Shabanov, 2024, p. 8]. Implementation is a large-scale project. It requires deep integration with ERP and WMS and a careful review of business processes.

With comprehensive process support, TMS reduces empty runs and assigns jobs precisely. It allocates tasks intelligently, taking account of vehicle characteristics, required equipment, load type (including ADR), and driver licences and availability. Integrated digital maps allow optimal route planning for heavy goods vehicles. They rely on real-time data [Michalska & Kubiczek, 2017, p. 86]. The benefits are multidimensional. Operating costs fall thanks to automation and better transport planning. Resource utilisation improves, and work becomes more automated, which raises efficiency and throughput. Customer service also improves, as TMS provides accurate shipment tracking and better on-time performance. In addition, the system supports risk management and regulatory compliance. To maximise these gains, the TMS must be fully compatible and tightly integrated with other systems such as ERP and WMS.

5. Technological trends

The rapid development of information technologies, discussed in the previous section, continues to drive the evolution of logistics processes. Beyond solutions already in place, new and disruptive trends are emerging. They are reshaping how modern firms operate. These technologies connect advanced data processing with the physical world. They promise further automation, optimisation and stronger competitiveness.

One key direction is Edge AI. It moves computational intelligence directly to the devices at the operational front line. Edge AI is an interdisciplinary technology. It applies stream analytics, machine learning and deep learning to process data at the

"edge" of the network in latency-sensitive applications [Badidi, 2022, p. 2]. Edge devices are the hardware on which AI models run. They are small and energy-efficient. Crucially, they compute locally, close to where data are gathered [Tobiasz et al., 2023, p. 2; Szpilko et al., 2023]. Typical devices include sensors, cameras, barcode scanners and intelligent robots situated near the data source. Unlike traditional setups, where data are sent to a central server or cloud, Edge AI processes them on the device. This avoids communication delays and eases network load.

Real-time processing also underpins digital twins. Digital twins are virtual replicas of physical objects, processes or systems. Their defining feature is tight integration with physical counterparts, which enables two-way data exchange in real time. The technology supports visualisation, collaboration and decision-making [Holopainen et al., 2024, p. 1779]. In effect, digital twins provide an advanced simulation environment. Firms can test changes in a safe virtual space before making them in the real world. The approach is proven in manufacturing, urban planning and healthcare. In logistics, it targets core operations. Twins of warehouses, transport networks or single vehicles allow teams to simulate new layouts, trial alternative delivery routes and predict vehicle failures. The outcomes include cost savings and higher efficiency. For such twins to work smoothly, especially for real-time data transfer, robust wireless communications are essential. 5G is the leading option.

5G (fifth generation) is not merely an evolution of 4G. It is a breakthrough designed to cope with surging data consumption. Its primary aim is to prevent network congestion in areas with dense user traffic [Fehmi et al., 2022, p. 597]. The standard spans three main use categories. URLLC delivers ultra-reliable, low-latency links, which are vital for, for example, autonomous vehicles. mMTC connects large numbers of devices and thus enables the Internet of Things (IoT). eMBB offers far higher throughput and lower latency, supporting advanced applications such as 4K video and virtual reality [Fehmi et al., 2022, p. 596]. In logistics, 5G transforms operations. Fast links to IoT sensors improve shipment tracking. In warehouses, it underpins advanced robotics and automation, including automated guided vehicles (AGV) and autonomous mobile robots (AMR). Low latency and high bandwidth also support augmented-reality tools that assist staff and lift productivity. In a wider digitalisation agenda, 5G matters for document flows too. Efficient electronic documentation streamlines transport processes.

A prime example is the eCMR. It is the digital counterpart of the international CMR consignment note. The eCMR enables real-time tracking, continuous access to transport data and lower costs compared with paper documents [Dziechciarz, 2018, p. 27]. Shipment data, status and location, can be updated live and shared with all parties to the transport.

Standards such as eFTI take digitalisation a step further by easing and standardising information exchange. eFTI refers to the use of digital technologies to manage and share freight-transport information. The system is designed to improve the efficiency, transparency and security of transport processes. It does so by automating and standardising information exchange between shippers, carriers, logistics providers and government agencies [Chountalas et al., 2023, p. 5]. In practice, eFTI raises efficiency and reduces costs. It also increases transparency and the traceability of consignments. The system strengthens security and regulatory compliance, which improves customer service. Through automation and standardisation, eFTI supports better decision-making and boosts flexibility. It also enhances the scalability of logistics operations.

6. The impact of information technology on the functioning and sustainable development of companies in the TSL sector

Information technologies also play a pivotal role in advancing corporate sustainability. By definition, sustainable development seeks to meet present needs without jeopardising the ability of future generations to meet theirs [Kowalska & Misztal, 2020, p. 27; Szpilko & Ejdys, 2022]. The concept is closely linked to the ESG framework. ESG provides a structure built around three factors: Environmental, Social and Governance. Investors use it as both a standard and a strategy to assess corporate behaviour and likely future financial performance. In this sense, it functions as a lens for evaluating sustainability [Li et al., 2021, p. 1].

The environmental pillar is central in logistics, which by its nature contributes materially to greenhouse-gas emissions and resource use. IT supplies tools that optimise processes and directly cut environmental impacts. A core application is carbon-emissions management. Precise data from information systems make accurate measurement and reporting possible. Route optimisation in TMS reduces empty mileage and shortens distances. Fuel use falls, as does CO_2 output. Digital twins, as advanced simulations, let firms test process changes virtually, for example, improving warehouse space utilisation. Better layouts can lower energy consumption. Documentation is changing too. Replacing paper with digital consignment notes such as eCMR saves raw materials and reduces waste. In short, better-managed operations enabled by innovative technologies become a marker of environmental responsibility.

Sustainability in logistics also has a social dimension. It concerns working conditions, skills development and customer satisfaction. Modern systems improve day-

to-day work. CRM supports customer-relationship management and reduces administrative load. Pick-by-Light and Pick-by-Voice minimise errors and make tasks more intuitive and less stressful. Workforce development follows. Instead of repetitive activities, staff learn to operate advanced IT systems. Their market value rises, and their roles become more analytical and strategic. Customer satisfaction improves as well. Real-time shipment tracking via eCMR and better delivery punctuality through TMS build trust and transparency. These technologies also strengthen corporate social responsibility. Firms that invest in sustainable solutions enhance brand reputation and appeal to more discerning consumers.

Beyond environmental and social outcomes, modern IT is fundamental to the economic pillar of sustainability in logistics enterprises. It streamlines processes and lifts financial efficiency. TMS supports optimal route planning and proper asset utilisation, which lowers fuel consumption and improves the use of transport resources. eCMR and eFTI remove paper workflows and reduce administrative costs. In warehouses, WMS and RFID enable precise inventory management. Losses fall, operating costs decline and space is used more effectively. Competitiveness also increases. Firms that adopt sustainable solutions are viewed as innovative and responsible, which strengthens the brand and attracts new customers and partners. New business models emerge. For example, IT systems improve returns management, cutting cost and waste. The growth of digital twins opens advisory and simulation services, creating additional revenue streams.

Taken together, the evidence across all three ESG pillars is consistent. Information technologies are no longer just tools for operational efficiency. They are a transformative force that makes logistics more environmentally and socially responsible while also more profitable. The combined benefits, lower costs, higher customer satisfaction and a smaller environmental footprint, show that investment in digitalisation underpins the development of future-ready, sustainable logistics enterprises.

Conclusions

In the face of rising market demands and constant competitive threats, modern enterprises, especially in the logistics sector, cannot rely solely on traditional management methods. Success now hinges on digitalisation and the adoption of advanced information technologies. These create the foundation for operational efficiency, process optimisation and the building of competitive advantage.

Our analysis shows that modern IT plays a crucial role at every level of the organisation. ERP and CRM systems integrate business processes and strengthen customer relationships. Tools such as RPA automate repetitive tasks, which lowers costs and increases scalability. In project management, software such as Microsoft Project and Microsoft Teams supports planning and communication. This, in turn, enables the effective delivery of complex tasks. A detailed review of the logistics sector finds that systems such as SCM, WMS, RFID and TMS do more than streamline the flow of goods. They also open new possibilities by using future-oriented technologies such as Edge AI and digital twins, supported by fast 5G connectivity.

The article also shows that technology's impact goes beyond pure efficiency. In the context of sustainable development, the ESG standard provides the key assessment framework. Route optimisation and the digitisation of documents benefit the environment. Automation and new technologies improve working conditions and help develop human capital. From an economic standpoint, these technologies reduce costs, strengthen competitiveness and enable firms to create new, innovative business models.

In sum, information technologies have become a driving force. They allow logistics enterprises not only to achieve better results, but also to build responsible and future-oriented operations. The adoption of innovative solutions is therefore not optional. It is necessary to meet today's market challenges and to secure long-term, sustainable growth.

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Nowoczesne technologie informatyczne usprawniające zarządzanie przedsiębiorstwami. Przykłady z branży TSL

Streszczenie

Skuteczne zarządzanie współczesnymi przedsiębiorstwami wymaga wykorzystania technologii informacyjnych. Stanowią one odpowiedź na wyzwania związane z globalizacją i intensywną konkurencją. Niniejszy artykuł analizuje rolę technologii informacyjnych w zapewnianiu płynnego funkcjonowania i zrównoważonego rozwoju, ze szczególnym uwzględnieniem sektora transportu, spedycji i logistyki (TSL). Jego celem jest przedstawienie nowoczesnych technologii informacyjnych oraz ocena ich znaczenia dla funkcjonowania i zrównoważonego rozwoju przedsiębiorstw, ze szczególnym uwzględnieniem sektora TSL. W artykule omówiono podstawowe systemy informatyczne (np. ERP, CRM, RPA i Business Intelligence), które wspierają integrację procesów, automatyzację zadań i podejmowanie decyzji. Rozważono również specjalistyczne narzędzia łańcucha dostaw, w tym WMS, TMS i RFID. Narzędzia te optymalizują procesy magazynowe i transportowe. W dalszej części artykułu przedstawiono nowe trendy, takie jak cyfrowe bliźniaki i sztuczna inteligencja brzegowa. Wyjaśniono, co te trendy oznaczają dla przyszłości logistyki. W analizie podkreślono również potrzebę wydajnej komunikacji bezprzewodowej, w szczególności 5G, aby takie rozwiązania mogły funkcjonować w praktyce. Technologie informacyjne odgrywają ważną rolę we wspieraniu zrównoważonego rozwoju zgodnego ze standardem ESG. Technologia stała się siłą napędową, która umożliwia przedsiębiorstwom osiąganie korzyści ekonomicznych, środowiskowych i społecznych.

Słowa kluczowe

technologie informatyczne, zarządzanie, zrównoważony rozwój, branża TSL, logistyka