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DEEPENING THE INFORMATIZATION OF MANAGEMENT AND MARKETING PROCESSES

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ПОГЛИБЛЕННЯ ІНФОРМАТИЗАЦІЇ ПРОЦЕСІВ МЕНЕДЖМЕНТУ ТА МАРКЕТИНГУ

In connection with the acceleration of the digital transformation of the economy, the deepening informatization of management and marketing processes in modern enterprises is becoming increasingly important. It should be emphasized that one of the key factors in this process is the rapid expansion of the volume and structure of databases, which acts as a trigger for improving the tools of analytical information processing used for making managerial decisions. These changes also shape new approaches to promoting goods and services, developing marketing strategies, and overall management of such business processes. The purpose of the article is to study the features of deepening informatization of enterprise management and marketing processes through the lens of directions and mechanisms for expanding databases and improving tools for their analytical processing. The conducted research confirmed that the deepening informatization of enterprise management and marketing processes is not only a technical or organizational stage but also a significant transformation of the business operation logic in the context of the digital economy. Thanks to informatization, the very way of managing the enterprise, decision-making, strategy development, and customer interaction changes. These changes go deeper than just software updates — they represent a new style of doing business in the digital age. The authors have demonstrated that this

process is accompanied by a number of systemic shifts, among which the following should be highlighted: the rapid growth in the volume and complexity of data, requiring new approaches to its storage and processing; the integration of heterogeneous information sources, including internal ERP systems, digital channels, behavioral, and contextual data; and a shift in the analytical focus from retrospective analysis to predictive and prescriptive analysis, which not only allows forecasting but also enables the formation of optimal scenarios for managerial and marketing decisions. It has been proven that for the deepening of informatization, the most important factors are a high level of automation of routine processes and personalization of communication with clients. Moreover, as this process deepens, increasingly larger volumes of data are considered a strategic asset capable of creating long-term competitive advantages.

У зв'язку із прискоренням цифрової трансформації економіки дедалі більшого значення набуває поглиблення інформатизації процесів менеджменту та маркетингу сучасного підприємства. Наголошуємо, що одним із ключових чинників цього процесу є стрімке розширення обсягів і структур баз даних, які стають тригером вдосконалення інструментів аналітичної обробки інформації, що використовується для прийняття управлінських рішень. Ці зміни також формують нові підходи щодо просування товарів і послуг, побудови маркетингових стратегій і загального управління такими бізнес-процесами. Метою статті є дослідження особливостей поглиблення інформатизації процесів менеджменту та маркетингу підприємства крізь призму напрямів і механізмів розширення баз даних та удосконалення інструментів їх аналітичної обробки. Проведене дослідження підтвердило, що поглиблення інформатизації процесів менеджменту та маркетингу підприємства є не лише технічним чи організаційним етапом, а й суттєвою трансформацією логіки функціонування бізнесу в умовах цифрової економіки. Завдяки інформатизації змінюється сам спосіб управління підприємством, ухвалення рішень, побудови стратегій і взаємодії з клієнтами. Це глибші зміни, ніж просто оновлення програмного забезпечення — це новий стиль ведення бізнесу в цифрову епоху. Доведено, що цей процес супроводжується низкою системних змін, серед яких варто виокремити: стрімке зростання обсягів і складності даних, що зумовлює потребу в нових підходах до їх зберігання та обробки; інтеграцію гетерогенних джерел інформації, зокрема внутрішніх ERP-систем, цифрових каналів, поведінкових і контекстних даних; зміщення аналітичного фокуса з ретроспективного (описового) аналізу на прогностичний і прескриптивний, який дає змогу не лише прогнозувати, а й формувати оптимальні сценарії управлінських і маркетингових рішень. Доведено, що для поглиблення інформатизації ключове значення має високий рівень автоматизації рутинних процесів і персоналізація комунікацій із клієнтами. Водночас із розвитком цього процесу дедалі більше обсягів даних розглядаються як стратегічний актив, здатний забезпечувати довгострокові конкурентні переваги.

Key words: marketing strategy development; general management; management; optimization of managerial and marketing processes; scale; data volume; analytical focus.

Ключові слова: побудова маркетингових стратегій; загальне управління; менеджмент; оптимізація управлінських і маркетингових процесів; масштабність; обсягів даних, аналітичний фокус.

PROBLEM STATEMENT

In connection with the acceleration of the digital transformation of the economy, the deepening of the informatization management and marketing processes in modern enterprises is becoming increasingly important. It is essential to highlight that a key factor in this process is the rapid growth of both the volume and structure of databases, which catalyzes the enhancement of the analytical information processing tools used in managerial decision-making. These changes also shape new approaches to promoting goods and services, developing marketing strategies, and overall management of such business processes.

Modern enterprises face the necessity of integrating large volumes of data from various sources — from internal ERP systems to external information streams such as consumer behavioral data or digital communication channels. In this context, databases not only serve as storage functions but also become platforms for deep analytical analysis, forecasting, and optimization of managerial decisions.

It is precisely these technological shifts that deepen the overall informatization of management and marketing processes, which we interpret as the systemic integration of digital tools for data collection, processing, and analysis aimed at enhancing the adaptability, efficiency, and effectiveness of managerial decisions.

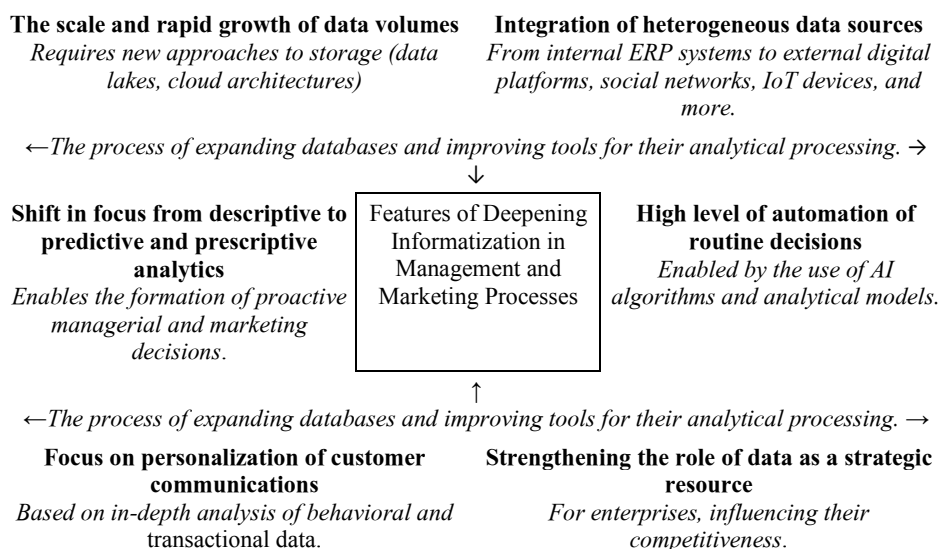


Fig. 1. Features of deepening informatization of enterprise management and marketing processes through the lens of directions and mechanisms for expanding databases and improving tools for their analytical processing

Source: compiled based on [3—4; 6].

The relevance of studying the outlined processes is due to the fact that, within such an approach, the enterprise transforms into a dynamic information-driven system capable of promptly responding to changes in the external environment, flexibly restructuring management practices and marketing strategies, and ensuring sustainable competitive advantages in the market.

ANALYSIS OF RESEARCH AND PUBLICATIONS

The issues of informatization of management and marketing processes have been thoroughly examined in the works of I. V. Zhalinska [1], T. V. Lazorenko [2], M. A. Severyn [3], H. Mashika, V. Zelic, A. Kiziun, R. Maslyhan, and others. In particular, scholars emphasize the strategic importance of digital technologies for enhancing the efficiency of managerial processes, developing customer-oriented marketing approaches, and transforming the information infrastructure of enterprises.

The works of M. A. Severyn [3—4] analyze challenges in integrating large data volumes, automating decisions, and personalizing communication, which are crucial in the modern digital economy.

At the same time, the specific features of deepening informatization of enterprise management and marketing processes have not been comprehensively studied, yet they represent a promising direction for further research.

FORMULATION OF THE ARTICLE'S OBJECTIVES

The purpose of this article is to investigate the features of deepening informatization of enterprise management and marketing processes through the lens of directions and mechanisms for expanding databases and improving tools for their analytical processing.

THE PAPER MAIN BODY

The deepening of informatization in enterprise management and marketing processes, with a focus on

expanding databases and improving tools for their analytical processing, began in the late 1990s to early 2000s. It was during this period that the widespread implementation of corporate information systems (ERP, CRM) was observed, enabling centralized collection, storage, and analysis of data related to the enterprise's operations, its customers, suppliers, and the market as a whole.

The next stage was the implementation of Business Intelligence (BI) technologies and real-time analytics, which coincided with the expansion of database capabilities — from traditional relational structures to flexible NoSQL repositories, cloud platforms, and Big Data infrastructures. Simultaneously, machine learning algorithms and predictive analytics were developed, enabling enterprises not only to describe the current state but also to forecast consumer behavior, optimize marketing campaigns, and automate managerial decision-making.

Currently, the basic features of deepening informatization of enterprise management and marketing processes include: the scale and rapid growth of data volumes; integration of heterogeneous data sources; a shift in focus from descriptive to predictive and prescriptive analytics; a high level of automation of routine decisions; an emphasis on personalization; and the strengthening role of data as a strategic enterprise resource. The features are outlined in more detail in Figure 1.

Taken together, these features indicate that the informatization of management and marketing has already moved beyond the functions of the IT department and transformed into a cross-cutting element of strategic management, which determines the effectiveness of enterprise operations and the formation of its market position amid the deepening digitalization of the economy.

Among the key features of deepening informatization in management and marketing processes is the scale and rapid growth of data volumes that modern enterprises handle. This phenomenon is driven not only by an increase in the number of internal transactions, documents, or customer records but also by the constant influx of

Table 1. Comparison of Data Lakes and Cloud Architectures ensuring scalability and rapid growth of data volumes within the informatization of management and marketing processes

Comparison parameter	Data Lakes	Cloud Architectures
Data type	Structured, semi-structured, unstructured	Depends on chosen services (structured/unstructured)
Data storage	Raw form (data is stored without prior structuring or transformation)	In structured or processed form via managed services
Scalability	High (designed to scale efficiently horizontally)*	Dynamic, with automatic scaling capability
Flexibility in processing	High (supports analytics, ML, ETL, etc.)	High, thanks to a wide range of services
Integration with analytical tools	Easy integration with BI platforms, ML frameworks	Built-in analytical and AI/ML services
Data availability	Depends on on-premises infrastructure or cloud deployment	Continuous (24/7) availability via internet connection
Cost	Can be lower due to "as-is" storage but requires configuration	Pay-as-you-go model, reducing capital expenditures on IT infrastructure
Typical platforms	Hadoop, Amazon S3 (in data lake mode), Azure Data Lake	Amazon Web Services (AWS), Microsoft Azure, Google Cloud

Note

*These systems enable the addition of new data storage volumes without requiring a complete system overhaul or significant cost increases. It means that an enterprise can scale its data volumes almost indefinitely by adding new files, formats, or data sources as needed — without compromising performance.

Source: compiled based on [1—3; 6].

information from numerous external sources — social media, mobile applications, web traffic, sensor devices (IoT), marketplaces, and more. Such an avalanche-like data growth makes the effective functioning of traditional information storage systems, particularly classic relational databases, impossible.

In response to these challenges, businesses are transitioning to new data storage architectures (see Table 1), specifically data lakes — flexible repositories that allow the accumulation of large volumes of structured, semi-structured, and unstructured data in their raw form — and cloud technologies, which provide dynamic resource

scaling, 24/7 data availability, and reduced IT infrastructure costs [3—4; 6].

The advantages of these solutions include scalability of management and marketing processes, flexibility in data processing, and the potential for optimization through the use of analytical platforms and machine learning tools.

Thus, modern approaches to data storage have become the foundation for building contemporary digital ecosystems within enterprises, where data functions as a strategic asset for management and marketing — possessing long-term value, informational richness, multifunctionality, and significance for competitiveness [6].

Table 2. Characteristics of tools for transformation, cleansing, and normalization of heterogeneous data within the informatization of management and marketing processes

Type of tool	Purpose	Key functions
Data transformation tools	Transforming data into a format suitable for analysis or integration	Formatting, aggregation, splitting/Merging fields, type conversion
Data cleansing tools	Detection and elimination of errors, omissions, and duplicates	Duplicate removal, filling or elimination of missing values, anomaly detection
Data normalization tools	Bringing data into a consistent format for further analysis and integration.	Unification of units of measurement, standardization of date formats, categorization of values
ETL platforms (extract, transform, load)	Integrated approach to extracting, processing, and loading data into storage systems.	Unification of units of measurement, standardization of date formats, categorization of values
Data management platforms (DMP, MDM)	Centralized management of data quality, availability, and consistency.	Creation of a "golden customer record", role-based access control, source synchronization

Source: compiled based on [1; 3; 6].

Table 3. Comparison of predictive and prescriptive analytics tools within the informatization of management and marketing processes

Comparison parameter	Predictive analytics	Prescriptive analytics
Goal	Forecasting future scenarios, trends, and customer behavior	Formulating optimal decisions and recommendations based on forecasts
Key Questions	<i>What could happen?</i>	<i>What should be done?</i>
Methods / Models	Regression analysis, classification, clustering, machine learning (ML), time series analysis	Optimization models, bayesian networks, decision theory, reinforcement learning algorithms
Typical Tools	Python (libraries Scikit-learn, XGBoost), IBM SPSS, RapidMiner, SAS Forecast Studio	IBM Decision Optimization, Google OR-Tools, MATLAB, Gurobi, Microsoft Azure ML Studio
Required Data	Historical data, behavioral patterns, transactions	Forecast data + scenarios, constraints, objectives, business logic rules
Analysis Outcome	Forecasting trends, probabilities, future actions, or outcomes	Recommendations for actions, scenarios of optimal decisions, automated decision-making
Examples in management	Sales volume forecasting, risk assessment, employee turnover prediction	Resource allocation optimization, supply scheduling, automation of logistics decisions
Examples in marketing	Consumer behavior forecasting, market segmentation, customer churn prediction	Pricing policy recommendations, identification of the best communication channels, budget optimization

Source: compiled based on [3; 6].

The ability to efficiently store and process data now constitutes a critically important condition for the effectiveness of managerial and marketing decision-making.

Among the core features of deepening informatization in enterprise management and marketing processes, a key role is played by the integration of heterogeneous data sources.

It should be noted that this refers to the combination of information from various internal and external sources that differ in structure, format, update frequency, and purpose. In particular, enterprises integrate data from [1; 3]:

1. Internal systems such as ERP systems, CRM platforms, accounting, and logistics modules.

2. External digital channels, including social media, marketing platforms, web analytics data, open sources, as well as information from IoT devices that can capture physical parameters of processes in real time.

Such integration enables the creation of a unified informational environment within the enterprise, where all data is consolidated and interacts within analytical systems. This ensures:

- a comprehensive view of the situation;
- understanding of customer behavior and operational processes;
- the development of personalized promotion strategies.

At the same time, processing heterogeneous data requires the use of modern tools for data transformation,

cleansing, and normalization, which in turn stimulates the development of analytical platforms and data management technologies, as demonstrated in Table 2.

The presented data prove that effective handling of heterogeneous data requires a comprehensive toolkit covering all stages — from initial processing to integration into analytical systems.

Among the fundamental features of deepening the informatization of enterprise management and marketing processes, it is worth highlighting the shift of the analytical focus from descriptive to predictive and prescriptive analytics (see Table 3).

Thus, while traditional descriptive analytics focuses on recording facts and analyzing past events, modern approaches aim at forecasting future development scenarios (predictive analytics) and recommending optimal decisions (prescriptive analytics) based on a large number of input parameters and possible courses of action (both regarding general development and product promotion) [3; 6].

Thus, the shift in analytical focus is critically important, as it enables enterprises to develop proactive managerial and marketing decisions, reduce uncertainty in dynamic environments, and identify new opportunities earlier than their competitors.

Among the fundamental features of deepening informatization of enterprise management and marketing processes, a high level of automation of routine managerial decisions should be highlighted [4; 6]. This automation is accomplished by actively using artificial intelligence

Table 4. Comparison of key tools for automating routine managerial decisions in the informatization processes of management and marketing

Comparison parameter	Purpose of parameter	Features of parameter	Areas of application
Artificial Intelligence (AI) algorithms	Automation of decision-making, simulation of intelligent processes	They independently make decisions, adapt to new conditions, and work with fuzzy data.	Automatic pricing, recommendation systems, chatbots
Machine Learning (ML)	Pattern detection, forecasting, classification	They learn from historical data and improve decision accuracy over time.	Customer segmentation, demand forecasting, fraud detection, and error identification in planning processes.
Analytical models	Explanation of relationships between variables, support for decision-making	Based on mathematical or statistical dependencies; require human intervention.	SWOT analysis, ABC-XYZ analysis, regression models, campaign performance analysis

Source: compiled based on [4; 6].

algorithms, machine learning, and analytical models. These technologies allow for the rapid and accurate processing of large volumes of data, facilitate pattern recognition, and enable the automatic generation of decisions with minimal or no human intervention. A comparison of the outlined automation tools for routine managerial decision-making in the informatization of management and marketing processes is presented in Table 4.

Specifically, in management and marketing, processes such as dynamic pricing, inventory management, customer segmentation, targeted advertising campaigns, sales forecasting, and determining the timing and channel of communication with customers are automated. It significantly reduces the operational burden on managers, increases the speed of response to market changes, minimizes human error in decision-making, and consequently enhances the accuracy and effectiveness of management.

Among the fundamental features of deepening informatization in enterprise management and marketing processes, special attention deserves the focus on

personalization of communications with customers [2; 5]. This personalization is not just a trend but a necessary condition for effective interaction with the target audience, based on in-depth analysis of behavioral, transactional, sociodemographic, and contextual data (see Table 5).

Personalization of customer communications enables the creation of tailored offers, determination of the optimal channels and timing for contact, as well as adaptation of marketing messages to the needs and expectations of individual consumers.

The use of analytical models, clustering algorithms, machine learning, and natural language processing (NLP) allows enterprises to build dynamic customer profiles and automate personalized interaction processes. This, in turn, increases customer satisfaction, fosters loyalty growth, improves conversion rates, and provides competitive advantages in the market.

Thus, personalization, as a result of marketing informatization, shifts from the realm of mass communication to individual dialogue, aligning with the modern

Table 5. Comparison of data types used for personalizing customer communications within the informatization of management and marketing processes

Data type	Characteristics	Role in personalization	Typical sources
Behavioral data	Data about user actions on websites, apps, and interactions with advertisements.	Enable tracking of interests, intentions, and stages of the customer journey.	Web analytics (Google Analytics), mobile applications, CRM
Transactional data	Information on purchases, orders, frequency, average check, etc.	Determine consumer habits and price sensitivity.	ERP systems, e-commerce databases, payment services
Sociodemographic data	Age, gender, income level, place of residence, occupation.	Allow adaptation of content and offers to specific customer segments.	Registration forms, social networks, external databases
Contextual data	Data on current location, device, time of day, weather, interaction channel.	Ensure relevance in real-time interactions.	IoT, geolocation, push notifications, cookies, device sensors

Source: compiled based on [1—2; 5—6].

expectations of digital consumers and the strategic goals of businesses [3; 5].

Among the fundamental features of deepening informatization in enterprise management and marketing processes, a key role is played by the strengthening of data as a strategic resource, which directly impacts the level of competitiveness. In today's conditions, data cease to be merely an operational tool for reporting or accounting — they transform into a valuable asset that forms the foundation for making strategic management and marketing decisions.

The accumulation, systematization, and analytical processing of large volumes of data enable enterprises not only to gain a deeper understanding of internal processes and market dynamics but also to respond promptly to changes in the external environment, forecast trends, adapt business models, and develop personalized approaches to customers.

Businesses that effectively utilize data as a strategic resource gain an informational advantage, leading to greater flexibility, improved planning accuracy, enhanced innovation, and increased long-term growth in the business's value. In the digital economy, it is data-rather than just production or financial resources-that increasingly becomes the core of a company's strategic value.

CONCLUSIONS

The conducted research confirmed that the deepening informatization of enterprise management and marketing processes is not merely a technical or organizational stage but a significant transformation of the very logic of business operations in the digital economy. Thanks to informatization, the very way enterprises are managed, decisions are made, strategies are built, and customer interactions occur has changed fundamentally. These are deeper changes than just software upgrades — this is a new style of doing business in the digital age.

The authors demonstrated that this process is accompanied by several systemic shifts, among which the following should be highlighted: the rapid growth in the volume and complexity of data, necessitating new approaches to its storage and processing; the integration of heterogeneous information sources, including internal ERP systems, digital channels, behavioral and contextual data; and the shift of analytical focus from retrospective (descriptive) analysis to predictive and prescriptive analytics, which enables not only forecasting but also the formation of optimal scenarios for management and marketing decisions.

The authors have proven that for deepening informatization, the most important factors are a high level of automation of routine processes and personalization of communications with customers. Moreover, as this process advances, increasing volumes of data are regarded as a strategic asset capable of creating long-term competitive advantages.

Together, these characteristics indicate a shift of informatization from being a supporting function of IT departments to becoming a strategic factor that influences all key aspects of an enterprise's activities — from developing marketing strategies to operational resource management. Thus, informatization of management and marketing is a fundamental prerequisite for ensuring

adaptability, innovativeness, competitiveness, and overall efficiency of the enterprise in the context of rapid digital transformation of the economy.

Prospects for further research include the development of strategic management models that integrate predictive and prescriptive analytics tools, as well as studying the impact of informatization on the transformation of business models across various industries in the digital economy.

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