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Methodological Aspects of Data Management at the Enterprise

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ABSTRACT

This article explores the formation of a unified methodological framework for data management within modern enterprises. The **relevance** of the topic stems from ongoing changes in economic and social structures, driven by digital transformation and the increasing importance of information as a critical resource. Data is now recognized as one of the most valuable assets in contemporary business. Companies striving not only to achieve their business objectives but also to ensure long-term, sustainable market performance face the urgent need to develop tools and workflows for managing data of varying quality and formats. The **aim** of this study is to examine both fundamental and forward-looking methodological aspects of data handling and to identify the key characteristics of this process. Data management — across its many forms, as discussed in the article — is conceptualized as a comprehensive system based on a digital model that supports the effective operation of businesses in the face of new technological implementations. The authors identify the structural elements of such a system and highlight the interdependence between the development of methodological approaches to data management and the broader digital transformation of companies. The research methodology includes analysis, deduction, and analogy. The findings may be of interest to both domestic and international researchers for further study in the field of enterprise data management methodology, to business professionals seeking to optimize their data management strategies, and to students and postgraduate scholars studying enterprise data management.

Keywords: data management; information society; digital transformation; methodological aspects of data management; data management system; information resources of the enterprise

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INTRODUCTION

The era of digital transformation generates a growth of relevant issues related to building a data management system in enterprises. It occurs largely due to peculiarities of the social progress and the transition to the information model of society, where information becomes the main resource and the driving force of further development [1].

The growing necessity of data solutions for modern companies requires the creation of tools dealing with data management, as well as the formation of complex methodological aspects. Data management becomes an indispensable condition for achieving high efficiency of business operations and its strategic goals, as well as for maintaining market competitiveness.

In a rapidly changing world, it is not enough just to introduce digital tools into the enterprise management system. Their management faces serious problems, often related to the structural reorganisation of business processes, in view of modern socio-economic phenomena [2].

In recent years, new tools have appeared in the field of digital transformation (their number has increased more than 20 times), most of which related to data management. Firstly, the issues of methodological support of this process are related to a significant increase in the importance and value of information for successful operation of companies. For example, currently the proportion of entities, which actively operate with data analytics to optimise core business processes, has grown from 60 to 82 per cent and it continues to grow.[1]

Secondly, the relevance of considering these problems is confirmed by the general course of development of the domestic economy aimed at the transition to the information economy. In this regard, it should be noted that the timeliness of scrutinising this issue is related both to the implementation of processes of comprehensive digitalisation of modern business, as well as to the reorientation of the country's economy to ensure the formation of a system of management of basic processes by means of the use of a global digital ecosystem of various types of data.

It is impossible not to mention the importance of the approval and implementation of the national project in the field of transition to a digital domestic economy, which is a data economy.[2] With the rapid development of digitalisation and the introduction of various digital management tools, it is logical to move from the partial application of elements both economic and information data management to the widespread use of a fully formed system for this purpose.

The objective of the research was to study the peculiarities of the methodological support of the modern enterprise management process based on information and economic data, to form a new approach to determining its structure and stage, as well as to develop the author's definition and approach to the implementation of this process in enterprises. In the course of the research, the procedure of implementation of data management elements in the everyday practice of business, which functions within the framework of the implementation of the new national project "Data Economy".[3]

It is important to point out, that these issues are mostly analysed from the point of view of the main activity of the enterprise, however, its close interrelation is traced with the IT sector. For example, the transition to a new management format is impossible without prior preparation, including the digitalisation of business processes and the consolidation of the information received into a single format. This is necessary for further

[1] Data Management. Data Management. TAdviser. 06.10.2024. URL: https://www.tadviser.ru/index.php/Статья: Управление_данными_(Data_management).

[2] National project "Data Economy and Digital Transformation of the State". URL: http://government.ru/rugovclassifier/923/about/

[3] National project "Data Economy National projects of Russia. URL: https://национальныепроекты.рф/new-projects/ekonomika-dannykh/

processing, storage and use aimed to achieve the company's objectives.

RESEARCH METHODOLOGY

Scientific methods of deduction and analogy were used to research economic and other data related to management, which characterise modern businesses, as well as methodological support of this process. In the course of the research, theoretical information on the real practice of data management in the company was collected and scrutinised, the information obtained was analysed and processed, in particular:

The main aspects of the formation of the data management system in the enterprise were analysed, as well as the structure of the key elements forming the structure of the company's business process management based on the received data, as well as styles and approaches to their management. In addition, the main business processes related to the development of the information management system were studied.

Comparative analysis. In order to identify further prospects for the development of business process management, the main tools ensuring the effectiveness of data management in the company were analysed and compared; the differences between information management styles were identified.

The result of the research was the formation of the author's approach to the process of methodological support of business data management, as well as conclusions about the state of business processes and peculiarities of their management.

The information base was the scientific works of domestic and foreign authors, periodicals, regulatory and legal acts, as well as research and information on real business practice related to data management and the creation of a system for implementing this process.

It should be noted, that during the research work the authors of the article took into account and observed scientific principles of objectivity, verifiability, representation and generalisation.

RESULTS

The concept, characteristics and current state of business data management

For any successful company, data is becoming an increasingly valuable resource that requires not only careful processing and structuring, but also the formation of a full-fledged management methodology.

A real threat and serious problem today is cybercrime. The interest of criminals in confidential information is constantly growing, since today it serves as a full-fledged source of information about business processes and technologies of a company, its financial results, employees, and so on.

This situation largely determines the importance and necessity of creating an effective strategy for working and managing data. This becomes a real direction of development of modern business management, which represents a proactive activity of companies to develop a policy on introduction and use of a set of rules for handling information arrays. Clear compliance with data handling policies should be required from both employees and managers of each company.

Such an approach will not only ensure that companies maintain a stable and relatively high level of confidentiality protection, but it will also allow them to demonstrate high levels of efficiency and financial health.

For instance, according to statistics, the market for business process management of modern enterprises based on information and statistical data will grow to 11.84 billion USD by 2028 at a compound annual growth rate of 12 per cent,[4] and information management will increase the efficiency of companies by an average of 70 per cent.[5]

Before considering issues related to providing a methodological basis for data management in modern business, it is necessary to clarify that at

[4] Statistics of business process management. Next Consulting. 13.01.2021. URL: https://nextconsulting.ru/articles/statistika-upravleniya-biznes-processami

[5] Ibid.

the enterprise level it represents the totality of information collected and processed for making managerial and strategic decisions. It can be both operational (namely, the information obtained by the company directly in the process of its functioning) and analytical, representing the results of any research.

Setting up a data management system in a modern company is a rather long and complex process that involves significant financial and labour costs. However, it is important to note, that the possible damage to the company's reputation and condition can be much more serious than the money spent.

For creating and implementing an information management methodology, it is imperative to consider a number of specific features, such as the following:

- Defining the objectives of policy formation and rules of data management in the company.
- Informing persons regularly, if they are interested in the development and updating of the system of working with databases.
- Clear distribution of tasks and areas of responsibility among those involved in the development of methodological aspects of data handling in each individual enterprise.

It is important to note, that the majority of modern companies, despite the growing importance of data and their allocation as a separate group of resources, do not have an information management system (as opposed to financial or labour management). Nowadays, according to statistics, only about 1 per cent of organisations have a sufficient level of control over their production activities based on economic data.[6] Undoubtedly, this is an extremely low indicator, which manifests the inability of modern business to fulfill completely the potential and initiatives of digital transformation.

It should be emphasized, that when laying the foundations of the company's data management, it is necessary to solve a number of urgent tasks, including the following: handling the quality of information in accordance with the norms and standards accepted in the company, managing the life cycle of data and ensuring uninterrupted access to it by involved parties, as well as implementing other business processes related to dealing with information. At the same time, the main issue is to ensure the most effective use of data to achieve the strategic and operational goals of the organisation.

The current state of corporate information data management processes and possible prospects for further development of this area of management are represented by maturity levels, which can be identified through a comprehensive assessment. This involves analysing all the methodological aspects and elements of data management, both individually and in aggregate.

Let us consider in details the main maturity levels of data management systems in modern companies:

1. The lowest (zero) level is manifested by the complete absence of such a system (and its individual elements) and, as a consequence, the prospects and opportunities for its further development.

2. Initial level manifests the process, when information management is spontaneous and, as a rule, depends on the level of knowledge and skills of specific specialists and employees of the IT department. This level is characterised by inefficient and weak data handling, poor data quality and lack of control systems, as well as the use of limited and often outdated management tools.

3. Repeatable level (assuming the presence of still weak presence of discipline and systematic approach) manifests the presence of both the elements of a data management system and the operational tools, which are aligned with the flow of common business processes. In addition to this, this level represents an increasing emphasis on information quality, as well as a high level of information security and confidentiality.

[6] Ibidem

4. Established level of information management manifests creation, implementation and the use of standardised information for handling documents. It becomes more than just information received by the organisation, but acquires the status of a valuable resource that can and should be managed effectively (by means of the implementation of automation and digitalisation processes) in order to achieve business goals and ensure a high level of competitiveness in modern markets.

5. Managed level of maturity is based on a well-developed system to implement measuring, as well as various characteristics of data closely and continuously monitored. This level implies a full centralised planning of information gathering, risk management in this area and regular improvement of the quality of data used to achieve business objectives.

6. Optimised level of data management implies the assessment of the role of handling information with the aim to reach the company's key strategic objectives.

Enterprise Data Management System

It is possible to evaluate maturity levels of the data management system within a particular company both by using common and well-known business methods and tools (for example, Data Management Maturity Assessment). Besides, such assessment is possible by means of the company's own practical and theoretical developments, which also allow estimating the real state of affairs in the field of working with and managing information.

The creation of such a personalised assessment methodology enables the implementation of an expert approach to the identification of management fundamentals through the creation of an author's assessment chart. Such methodology helps to assign and manage expert points for each specific methodological aspect of work with information data of the enterprise (*Fig. 1*).

In order to make this process to become more effective (which not only requires enormous human and material resources, but also produces visible results), its individual methodological

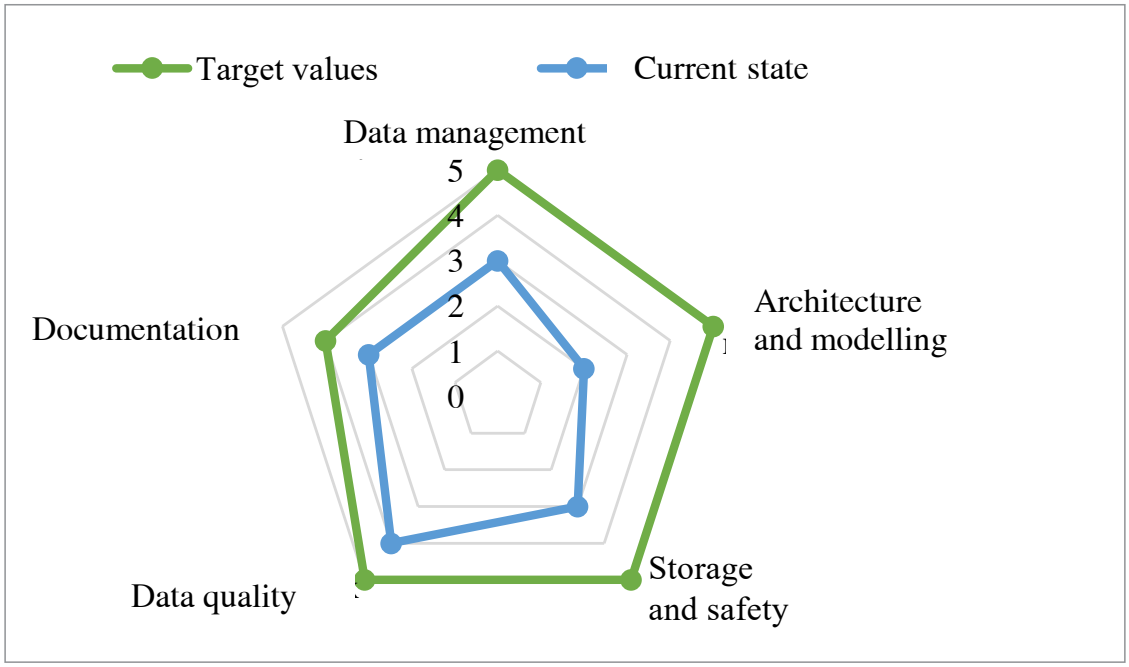

Fig. 1. **Example of Expert Assessment of Maturity Level of Information Data Management**

Source: compiled by the authors.

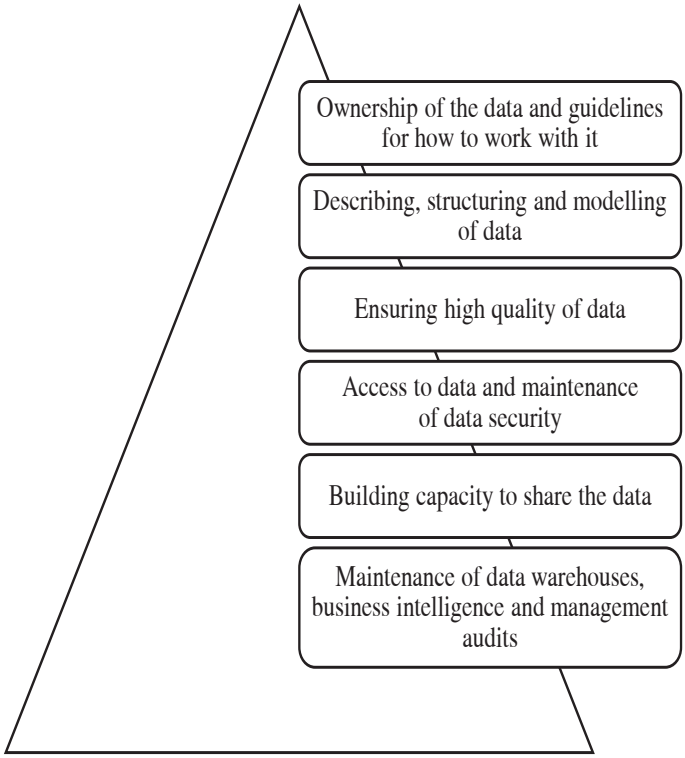

Fig. 2. **Structural Elements of Data Management System in an Enterprise**

Source: compiled by the authors.

aspects must be integrated into an overall system (*Fig. 2*).

Its elements can be viewed as a structure, which determines the management of business processes based on both analysis and current information. During the research work, the authors have revealed that the set of management elements for each particular enterprise is specific and unique. It is necessary to take into account for its formation the specifics of the enterprise, the branch of its functioning, the scale and peculiarities of business processes [3].

In view of the concept mentioned above, the authors of the article have identified several key styles of data management based on the study of theoretical materials and practical experience of modern business functioning (*Fig. 3*).

In order to choose one of them, the management of the company should take into account not only its peculiarities and features, but also the cost of developing and implementing the data management system, market development trends, external threats, as well as the

Register style	• Assumes strict algorithms for data cleansing, identification of business information • Suitable for entities that use multiple data sources to implement business processes
Consolidation style	• Combines sepqrate business process into a "golden data" record to ensure implementation of efficient business process • Enables data for business analysis
Implementation style	• Data from various sources processed in real time to help managerial decisions • Simplifies business analysis and reporting
Centralised style	• All business process data stored in a central hub, which reduces errors to minimum • All enterprise systems linked to a central hub where data is concentrated

Fig. 3. **Main Data-driven Business Process Management Styles**

Source: compiled by the authors.

Table 1

Principles of Methodological Data Management in an Enterprise

Management principles	Brief description
Principle of ownership	It is mandatory, that a certain employee is responsible for the state of the business information data.
Principle of description	The data in the company must be systematised in compliance with its characteristics and purposes of use.
Principle of quality assurance	The information data must be of high quality for business tasks solution.
Principle of accessibility	The information should be - always accessible to different users; - protected from losses.
Principle of sharing	The information should be stored in a form that is always accessible to different users.
Principle of control	Data management should be comprehensive, bearing in mind of its specificity and uniqueness.

Source: compiled by the authors.

company's corporate structure and strategic objectives.

Methodological aspects of the enterprise's data management system

The basic elements of the enterprise's methodological data management system (including some various approaches to its implementation) depend on a number of principles, as well as on characteristics, some of which are presented below in detail in *Table 1*.

Following the principles listed in *Table 1* ensures the functioning of a full-fledged management system. The components of the system include not only complex work directly with information data, but also the development of its architecture, the use of processes and tools (including digital) to achieve a high level of data quality and security, as well as the organisation of its storage and transmission.

Data management models of modern enterprises

In its most general form, data management models within a particular business entity become a set of interrelated technical, economic, social and legal elements.

For a more detailed definition of such models, below we shall consider effective approaches to their organisation:

- The hierarchical model reflects a way of organising data, which is structurally arranged from top to bottom, starting with the most significant level of information and ending with lower level elements unrelated to each other.
- The network model of data management also implies the separation of information elements by their level. In this case, the data has a closely linkage in itself and forms a network of business information.
- The relational model is aimed to systematise information in a table format that provides both the most convenient and rapid access to information and centralised data storage.

In addition to those presented above, we note the effectiveness for business of operational models of data management, which unite specific subjects, namely, participants of business pro-

cesses and procedures, the coordinated functioning of which allows to achieve the strategic goals of the enterprise through productive work with information and its qualitative processing.[7] Let us visualize the most common models of this type.

• Centralised operating model with a single data management centre and a person responsible for its operation.

• A hybrid-operating model that involves continuous coordination of data management processes and control over the functioning of decentralised information management entities (which regulate the business processes of the enterprise).

• A federated operating model that provides an additional level of hierarchy within information data management.

Improvement of the information management system (as the most important direction of modern business development), as well as selection and further introduction and application of a certain model for this purpose (i.e. meeting all goals and needs of each particular business entity) should begin with the assessment of the current state and real capabilities of enterprises in this area.

Stages of formation of methodological aspects of data management

The activity of companies is based on the implementation of various business processes related to organising collection, processing, storage and subsequent use of information data to achieve their strategic goals and, if necessary, the elimination of irrelevant information and its digital footprint [4] (*Fig. 4*).

Here we explore the most significant stages of implementation of data management related to information management methodology in the enterprise.

The process of data management in a company always starts with identifying the need for data. Firstly, for further work, it is important to determine the typology of data, which is required to achieve a particular company objective or to improve the efficiency of its business processes. Secondly, it is essential to describe clearly the sources of information and the criteria for assessing their quality [5].

The process of data management in a company always begins with a step such as identifying the need for data. For further work, it is important, firstly, to determine the typology of data required to achieve a certain goal of the enterprise,

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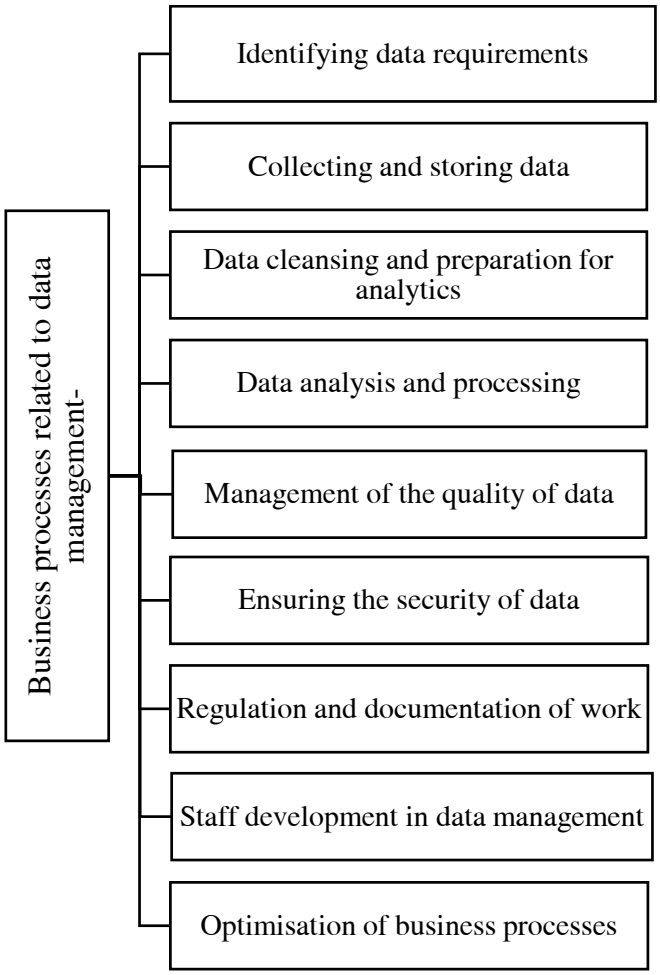

Fig. 4. **OKey Business Processes Related to Organizing Data Management in a Modern Enterprise**

Source: compiled by the authors.

[7] National Standard of the Russian Federation "Reference Model of Data Management". URL: https://gostassistent.ru/doc/bdb97915–1db4–4afb-bf14–3ca21f06637f

Having identified the need to obtain certain data for the development of the company's activities, the task of the management system is to organise the processes of collecting and subsequently storing the required information. It is particularly important to set up a list of data sources, both external and internal. In addition, it is necessary to select the most optimal method for each particular business entity to obtain the necessary information, as well as a reliable, secure and scalable method of storage [6].

One of the most significant stages of data management is its preparation, thorough analysis and processing, which primarily involves correction of errors and data integration, namely, bringing different types of data into a common format.

As for data analysis, the approach to this process requires the choice of the most effective method and tools for its implementation. It is worth mentioning that the most relevant and productive digital tools are developed on the basis of indigenous software which supports a high level of confidentiality and privacy [7].

Data processing being the most important part of working process with information for the management of modern enterprises as a whole, which also includes, among other things, the interpretation of the obtained results in an accessible and convenient form for making managerial decisions [8].

The following stage is data quality control and data security. The most essential methodological element of such activities becomes the generation of an all-round standardisation system of the quality of information received and subsequently used, which is manifested in the development and implementation of specific regulations and standards that correspond to the requirements and strategic objectives of the company. These documents also include the documentation of all data handling operations in accordance with a standard template.

Regular monitoring of the quality of information and its adjustment ensure the maintenance of the company's market reputation and increase its competitiveness [9].

A specific role in the methodical system of data management in the enterprise is performed by information security and the guarantee of data confidentiality. This includes the development and implementation of measures to protect the data from cyber hazards, as well as ensuring compliance with legislative acts in the field of information security [10].

Besides, it should be noted, that due to unstable and complex economic situation both in Russia and abroad, one of the top priorities becomes a further development of protective measures to ensure security of a company's data. In particular, the leakage of any confidential information may have dramatic consequences for the company and the socio-economic system as a whole.

Another no less important methodological aspect of information management is activity related to the development and training of the company's employees. In current situation, employees are required to improve their skills constantly and competences in this area [11], which leads to positive results on the functioning of the company in the market environment as a whole.

Finally, data management involves permanent analysis of the modern business processes of the enterprise to reveal shortcomings and adjust them. It also needs to implement activities aimed at developing and introduction of innovative technologies that enable to multiply not only the efficiency of the functioning of the business entity, but also its level of digitalisation, which is especially relevant in the modern conditions [12].

Nowadays, in order to operate successfully and maintain a high efficiency of competitiveness, companies must constantly maintain and develop their capabilities in the field of collecting, storing, processing and other operations related to information data, as well as actively optimise and improve analytical work.

Companies should get adapted to changes in the external environment, as well as be guided

by the updates to legislation and the increasing role of state regulation in issues pertaining to information management.

In the course of the research work, the authors of the given article have analysed business processes of modern domestic enterprises related to the management of economic and information data, as well as also determined the most effective and promising directions of their development (*Table 2*).

Structure of the transition to modern databased business management

As a result of the authors' study of the main aspects of the formation of the system and methodological support for the management of business processes of enterprises based on data management, the latter was defined as a complex process involving several of the most important areas of business functioning, namely:

- its financial situation, technical and technological level of development;
- the level of training and qualification of the personnel;
- the company's level of maturity in terms of working with data.

At the same time, an essential factor is to determine the current state of digital transformation of production processes.

Effective data management requires not only following the patterns of data management system formation, which was mentioned above. It also indispensable to develop a strategy that includes both the business model of enterprise management (in view of the trends of digital transformation of social and economic spheres) and a comprehensive approach to work with data for eliminating the problem of different information resources.

The authors of this research work have developed the sequence of implementation for the

Table 2

Promising Directions for the Development of Data-driven Business Management System

Direction of development of business management based on data	Brief characteristics	Data management tools and technologies
Database Management Systems (DBMS)	A comprehensive tool for operating Big data to ensure its safe storage as well as fast and safe access to it for making an effective analysis.	Oracle Database, PostgreSQL, MySQL, MongoDB, SQLite
Cloud platforms	They are a tool for storing, processing and analysing data, providing a high level of data availability and reliability.	Yandex Cloud, VK Cloud, Cloud.ru, Selectel, Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP)
Data analytics and visualisation tools	They enable complex analytics and data visualisation, as well as automation of information analysis processes	Python, R, SQL, Tableau, Power BI
Machine learning and artificial intelligence	They enable automated data analysis and forecasting, as well as more informed management decisions.	TensorFlow, scikit-learn, IBM Watson

Source: compiled by the authors.

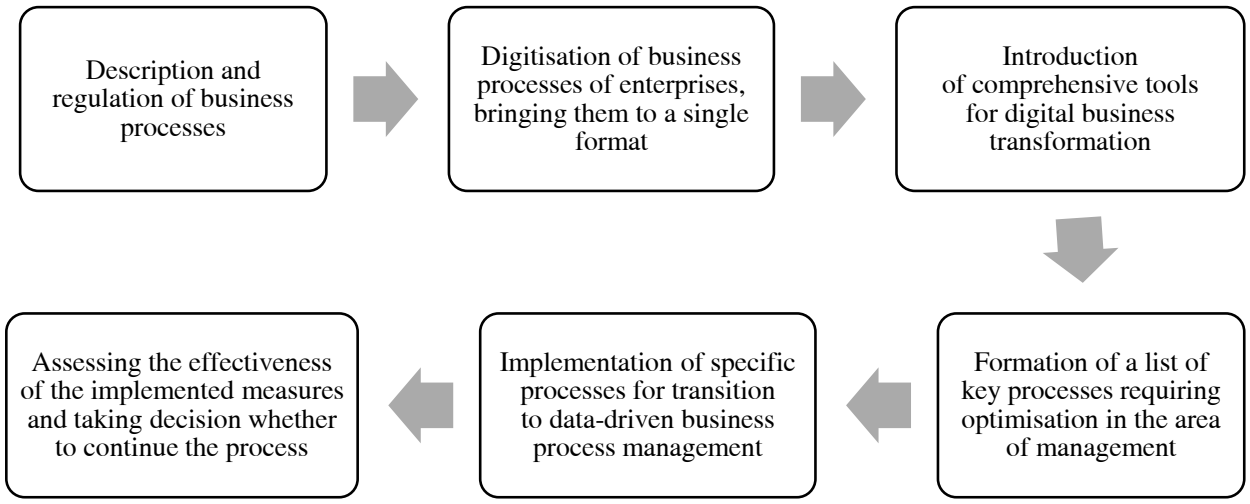

Fig. 5. **Structure of Transition to Data-driven Business Process Management**

Source: compiled by the authors.

principles of business process management based on work with information. This concept structure is presented below in *Figure 5*.

The principal advantage of the presented concept structure is its comprehensiveness, which implies coverage of the entire enterprise and coordination of key business processes. This in turn envolves the main objective of enterprises, which consists in effective and efficient provision of quality products and services to consumers at competitive prices. A characteristic feature of the transition to the management of the organisation's activities based on data management is the integration of technological, organisational and managerial, as well as theoretical and methodological components of business.

DICUSSION

Methodological aspects of information management at a modern enterprise seem to be an interesting research study. Currently, there exist several approaches to its consideration and evaluation. At the same time, the development and implementation of any methodological recommendations for operation with data in companies has become a fairly new problem conditioned by the rapid development of digitalisation in various sectors of economic activity. Besides, it occurs at a new phase of social development related to the constant generation and consumption of information data.

These issues have not yet been widely covered in the works of domestic and foreign researchers. Nevertheless, it is worth pointing out a number of scientific works, the authors of which have made a significant contribution to their consideration.

Thus, A.I. Repichev and H.M. Musaeva provided a detailed description of the data management process and its elements [13]. E.S. Filatova analysed in details in her comprehensive study such an important aspect as the culture of working with economic and information data [9]. The scientific research work of L.I. Zinin and L.I. Efremov [14] made a significant contribution to the formation of theoretical foundations of approaches to the management of companies' information system. The publication of Y.M. Lisetsky is also noteworthy due to consideration of an integrated approach to data management as a necessary resource of modern business [15].

Finally, it is noteworthy to mention separately the importance of the scientific research work of E. Sh. Shaimieva, G.I. Gumerova, I.S. Pleshanov and R.R. Garayeva, who studied the issues of com-

prehensive transformation of the domestic socio-economic system based on data management [16].

It should be noted, that the topic discussed in the article is of interest not only for scientists, but also for business industry representatives, consulting and analytical associations, as well as for specialists of various levels in the field of management, information technology and economics. They regularly publish reviews and studies on these issues.

Summarising all the undoubted advantages of managing the business processes of modern companies based on data management, it is impossible not to mention a few problems, including the inadequate content of information data. It affects the efficiency of analytical processes, as well as leads to problems in selecting optimal methods and tools for modelling production activity, which arise due to the variety of methods and operating-systems tools of information.

According to the results of the research devoted to the consideration of methodological aspects of information management in the enterprise, we can draw the following several conclusions.

First of all, in today's reality, information becomes not only a valuable resource of enterprises, but also a truly necessary factor of effective and profitable business activity, as well as the instrument to maintain a high level of competitiveness in a complicated foreign policy situation [17].

Secondly, working with information data, which has become obligatory for every company, cannot be carried out in a chaotic way. Like any business process, it must be regulated and well structured. This undoubtedly requires modern business entities not only to allocate material and physical resources, but also to organise methodological and structural elements of data management.

It can be determined, that nowadays, the basis of successful data management is directly the formation of its methodological aspects, which are a set of stages and elements aimed at regulating and managing the life cycle of information in the enterprise, as well as its effectiveness [18].

The considered approaches to the formation of the data management system, which served as a basis for the author's structure of business process management of enterprises based on data, can be effectively used for further theoretical research, as well as for improving the practical activities of modern enterprises.

CONCLUSIONS

In accordance with the results of the current research devoted to the consideration of methodological aspects of information management in the enterprise, the authors of the article are able to draw the following conclusions.

Firstly, in the current reality, information becomes not only a valuable resource of enterprises, but also a truly vital factor of effective and profitable business activity, as well as the mean for maintaining a high level of competitiveness in a complex foreign policy situation [17].

Secondly, the work with information data, which has become mandatory for every company. It cannot be fulfilled in a chaotic way. It must be regulated and well structured, like any business process. Undoubtedly, it requires modern business entities not only allocate material and physical resources for it, but also organise methodological and structural elements of data management.

It may be said, that nowadays, the formation of its methodological aspects has become directly the basis of successful data management. These aspects are a set of stages and elements aimed at regulating and managing the life cycle of information within the framework of enterprises, as well as its effectiveness [18].

The considered approaches to the formation of the data management system, which serve as a basis for the authors' structure of business process management of enterprises based on data, can be effectively used for further theoretical research, as well as for improving practical activities of modern enterprises.

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E.N. Sheremetyeva — scientific supervision, development of the general concept of the article.
A.K. Adgizalova — structuring of the article structure, identification of structural elements of data management in an enterprise, analysis of key business processes related to data management.
Yu.G. Popov — definition of data management principles at the enterprise in the context of digital transformation, formation of conclusions, analysis of information relevant to the research topic, and identification of problem areas in the data management processes of modern enterprises.

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