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RESEARCH ARTICLE

INFORMATION AND ANALYTICAL SYSTEMS FOR MANAGING THE PRODUCTION PROCESS

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ABSTRACT

Introduction. In an unstable economic situation, it is impossible to efficiently manage a production enterprise with complex technological processes without using automated systems. According to statistical data, the most widespread system in the Russian Federation and neighboring countries is 1C:ERP Enterprise Management 2, which is the main reason for studying its functionality for production management. The purpose of our research is to develop a production management concept using a Russian ERP system.

Materials and methods. The analysis of publications on production management and its business processes, as well as on automated management systems became the theoretical and methodological basis of the study. The methods of systematization and generalization of data were used, as well as the historical-economic, structural-functional, and expert methods.

Results and conclusions. The authors prove that modern ERP systems have tools for automatic control of an enterprise's business processes at the operational, tactical, and strategic levels. ERP systems allow for data exchange between interconnected business processes and contain tools for evaluating the work of structural units and performers responsible for the stages of a business process. In an ERP system, managers at various levels have access to up-to-date, reliable, and comprehensive information. By dividing access rights, the system provides a different set of tools for senior, middle, and junior managers to analyze the current situation and make management decisions. The authors offer recommendations for using ERP system tools to optimize the planning and control of production processes and related business processes for purchasing materials and selling finished products.

Discussion. The article may be useful for managers of diversified enterprises seeking to improve production management by implementing an ERP system. The analysis and conclusions made by the authors regarding this ERP system are also valid for 1C:ERP WE (World Edition), developed by 1C for foreign companies. Given the numerous successful implementations of 1C:ERP WE in various sectors in France, Spain, China, Mongolia, and other countries, the article may also be useful for managers of foreign enterprises considering the transition to an ERP system.

KEYWORDS

ERP, 1C:ERP Enterprise Management 2, business process, planning of the production process.

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AUTHORS' CONTRIBUTION

All authors participated in the development of the research concept, data collection, processing and analysis, writing the manuscript text, formulation of conclusions.

CONFLICT OF INTEREST

The authors declare interest conflict lack.

USE OF AI TOOLS DECLARATION

The author declares that he has not used Artificial Intelligence (AI) tools to write this article.

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ИССЛЕДОВАТЕЛЬСКАЯ СТАТЬЯ

ИНФОРМАЦИОННО-АНАЛИТИЧЕСКИЕ СИСТЕМЫ УПРАВЛЕНИЯ ПРОИЗВОДСТВЕННЫМ ПРОЦЕССОМ

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АННОТАЦИЯ

Введение. В условиях нестабильной экономической ситуации эффективное управление производственным предприятием, имеющим сложные технологические процессы, невозможно осуществлять без использования автоматизированных систем. Согласно статистическим данным, наиболее распространенной на территории Российской Федерации и в странах ближнего зарубежья является система «1С:ERP Управление предприятием 2», что послужило основной причиной изучения ее функциональных возможностей для управления производством. Цель нашего исследования – разработка концепции управления производством с применением российской ERP-системы.

Материалы и методы. Теоретической и методологической базой исследования послужил анализ публикаций по управлению производством и его бизнес-процессами, по автоматизированным системам управления. Использовались методы систематизации и обобщения данных; историко-экономический, структурно-функциональный и экспертный методы.

Результаты. Авторы доказывают, что современные ERP-системы обладают инструментами для автоматического контроля бизнес-процессов предприятия на оперативном, тактическом и стратегическом уровнях. ERP-системы позволяют осуществлять обмен данными между взаимосвязанными бизнес-процессами и содержат средства для оценки работ структурных подразделений и исполнителей, отвечающих за этапы выполнения бизнес-процесса. В ERP-системе менеджеры различных уровней имеют доступ к актуальной, достоверной и полной информации. За счет разграничения прав доступа система предоставляет разный набор инструментов руководителям высшего, среднего и нижнего звена для анализа текущей ситуации и выработки управленческих решений. Авторы предлагают рекомендации по использованию инструментов ERP-систем для оптимизации планирования и контроля процесса производства и связанных с ним бизнес-процессов закупок материалов, продаж готовой продукции.

Обсуждение. Статья может быть полезна руководителям многопрофильных предприятий, стремящихся повысить управление производством путем внедрения ERP-системы. Анализ и выводы, сделанные авторами в отношении данной ERP-системы, справедливы и для «1С:ERP WE (World Edition)», разработанной фирмой «1С» для иностранных компаний. Учитывая большое количество успешных внедрений системы «1С:ERP WE» в различные сферы деятельности Франции, Испании, Китая, Монголии и др., статья также будет полезна руководителям зарубежных предприятий, рассматривающих вариант перехода на ERP-систему.

КЛЮЧЕВЫЕ СЛОВА

ERP, 1С:ERP Управление предприятием 2, бизнес-процесс, планирование производственного процесса.

ДЛЯ ЦИТИРОВАНИЯ

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ВКЛАД АВТОРОВ

Все авторы участвовали в разработке концепции исследования, сборе, обработке и анализе данных, написании текста рукописи, формулировке выводов.

КОНФЛИКТ ИНТЕРЕСОВ

Авторы заявляют об отсутствии конфликта интересов.

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Авторы заявляют о том, что при написании данной статьи не применялись средства генеративного искусственного интеллекта.

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■ INTRODUCTION

Effective management of modern production is impossible without the use of automated systems. The success of their operation activity depends on the professionalism and the level of basic training of users, as well as their ability to utilize the functional capabilities of the system with a good result.

Currently, the search continues for the most effective methods and tools for managing the production process. Managers of diversified enterprises (including those with technically complex multi-stage production) are in need of both the automation of business processes and methodological support for the application of automated systems for successful production management.

At present, a significant amount of experience has been accumulated in structuring the production process, controlling key performance indicators of the enterprise, and coordinating the activities of its services and divisions. However, the existing practical knowledge is insufficient to enhance the resilience of the business, which necessitates the ongoing search for the most effective mechanisms for managing the enterprise from both economic and organizational perspectives; the development of a production organization concept that takes into account the rising implementation of digital technologies and intelligent materials[1] in the production process [1, p. 87].

The modern reality is such that effective management of the production process is only possible with the use of advanced information and analytical systems capable of monitoring all key performance indicators and areas of the enterprise's activities; rationally distributing financial, material, and labor resources; and quickly adapting to the changing conditions of the global and domestic economy. Automated

[1] Intelligent materials include materials that have a given complex of properties and certain functions. Intelligent materials are able to adapt to the influence of external factors, programmatically change their shape, density, structure, optical properties. Alloy with memory effect, nature-like materials, self-healing materials, materials with phase change and others. – URL: https://roscongress.org/materials/umnye-materialy-2025-perspektivy-i-vozmozhnosti-dlya-promyshlennosti-i-innovatsiy-v-budushchem/ (Accessed 15.07.2025).

systems of the ERP class serve as such systems. The collection, processing, and systematization of data arriving in various forms (textual, numerical, graphical) allow the ERP system to manage the production process and the interrelated financial and material flows highly efficiently, as well as to coordinate the activities of production workshops and the operation of manufacturing equipment.

The main goal of our research is to develop a concept for production management using a Russian ERP system, which is the most widely used in the post-Soviet space. The scientific novelty lies in the creation and justification of theoretical propositions for innovative production management, the development of methodological recommendations for the use of ERP system tools to optimize the planning and control of the production process, and the related business processes of material procurement and sales of finished products.

■ MATERIALS AND METHODS

The history of the development of the ERP concept is closely related to the evolution of enterprise resource management systems, which dates back to the late 1950s and early 1960s. During this period, there was a need for planning raw materials and supplies for rapidly developing large-scale production. The development of plans required a large number of complex mathematical calculations that were previously done manually and took a lot of time. As a result, there arose a necessity for automatic data processing.

The first information systems for production management were based on ROP[2] technologies aimed at developing purchase plans for raw materials and supplies based on data received from previous periods. According to this technology, the benchmark for replenishing stocks is the average purchase volume of each material over the past several months. Considering that a large number of different materials are required to produce any kind of product, the manual calculation of the average purchase volume is quite a labor-intensive process. To optimize the labor costs associated with performing these calculations, there was a need to involve automation tools.

The automated information system ROP advanced for the 1960s allowed for the determination of the reorder point taking into account the time needed for material delivery, and fully met the requirements of manufacturing enterprises. Over the course of a decade, the ROP system was continuously improved, gradually expanding its capabilities.

In the 1970s, with the emergence of the target market strategy aimed at the integration and planning of the production of specific types of products, the MRP[3] technology appeared, which allows for the planning of production resources based on the quantity of raw materials and supplies needed for the manufacture of certain products. Thanks to MRP, it became possible to create production plans for products taking into account both expected and working demand.

The emergence of MRP systems has fundamentally changed the fundamentals of production economics by automating inventory management, which has positively affected the predictability of the production process. Despite the fact that several decades have passed since the inception of MRP systems, they are still in high demand today, as evidenced by numerous publications in foreign and Russian scientific journals.

Thus, researchers from Indonesia A. Fakhri, A. R. Herliana, Ch. Amalesi, R. Nayaka Utomo shared the results of applying MRP technology for managing supply chains of materials in a street café [2], analysts I. N. Mutakin, D. P. Putra identified the advantages of MRP technology for planning materials used in construction [3], observers A. Bernique, A. Manurung, S. Sutarwan, and E. Devi Bringan reported on the advantages of using MRP technology for syrup production [4].

Scientists from Jordan A. Bataineh, Z. M. Shwiyat, O. Al-Bataineh studied the possibility of industrial waste rationalization using the MRP method [5].

Researchers from South Korea R. Guchhait, M. Sarkar, B. Sarkar, analyzed the capabilities of the MRP method for material requirements planning within the framework of a hybrid intelligent manufacturing system [6].

A scientist from New Zealand, R.N. Roy, concluded that the use of the MRP method contributes to the rationalization of procurement and increases the efficiency of restaurant operations. As confirmation, he published the results of the study on the application of MRP technology in the restaurant industry [7].

A researcher from the USA, M. Natarajan, examined the impact of the MRP method on supply chains [8].

The problem of planning material requirements using the MRP method has also attracted the attention of Russian researchers G. M. Andreasyan and M. E. Fedorov [9]. It is worth noting that there are significantly fewer Russian publications on the application of this method in practical activities compared to foreign ones. Russian researchers are more interested in comparative analysis of the functional capabilities of MRP and ERP systems for material inventory management [10].

The results of the studies presented above demonstrate the demand for the MRP system in various areas of activity. At the same time, a vast number of medium and large enterprises found the capabilities of this technology insufficient, which served as one of the reasons for the emergence of the more progressive

[2] ROP (Reorder point) – inventory management at the point of re-order.
[3] MRP (Material Requirements Planning) – planning the need for materials.

technology MRP II[4]. Another reason was the need to increase the competitiveness of the enterprise by improving the quality of the produced products.

The MRP II technology, based on the rational distribution of material and immaterial production resources, enables the modeling of production processes as well as more detailed planning:

– procurement of raw materials and supplies;
– loading of production capacities (equipment, main and auxiliary production workers);
– production costs;
– finance;
– activities of administrative personnel;
– production of semi-finished products and goods.

Thanks to MRP II technology, a unified integrated system for managing all the enterprise's resources has emerged.

Currently, numerous scientific studies are being conducted on the effectiveness of using MRP II technology in the manufacturing sector. Jordanian scientists Z. Shwiyat, A. Bataineh, N. Aljawarneh and O. Al. Bataineh assessed the impact of the MRP II system on cost optimization [11]. Researchers O. Al-Bataineh, N. Aljawarneh, A. Bataineh, and Z. Shwiyat identified a reduction in costs after the implementation of the MRP II system [12]. Indonesian researchers A. S. Sulistyaningsih, E. M. Widodo, A. Rifa'i evaluated the impact of implementing MRP II technology on inventory management [13]. Ukrainian researchers V. Novinsky and V. Popenko analyzed various aspects of the production process based on the MRP II method [14; 15; 16].

The development of the MRP II system was promoted by both the growing need for comprehensive management of all enterprise resources and the emergence of local area networks (LAN) that allowed computers to be interconnected. The use of LAN increased the speed and volume of data processing and provided interconnection across various areas of activity. MRP II technologies enabled the creation and analysis of different planning scenarios, which means that management now has at least three plans: optimistic, realistic, and pessimistic.

The concept of ERP[5], which emerged in the early 1990s, resulted in development of information and management technologies MRP and MRP II. Continuously improving, they allowed for increasingly effective control of material and financial flows, and more efficient management of production processes. The principles and approaches to planning developed for MRP and MRP II formed the basis for the creation of ERP systems.

By the end of the 20th century, there was an increase in competition in global markets, which contributed to a more active use of innovative technologies in production and an acceleration in making management decisions. Companies engaged in international business were required to develop skills in establishing new relationships with partners, quickly finding resources to establish and manage communications with clients and suppliers. During this period, information technologies continued to develop intensively, providing users with increasingly advanced technologies and a multitude of new tools. Thanks to these developments, industrial enterprises gained the opportunity for comprehensive management of business processes that are part of ERP systems. The business processes that can serve as such include:

– production (MRM);
– finance (FRM);
– customer and client relations (CRM);
– supply chains (SCM);
– interaction with suppliers (SRM);
– product lifecycle management (PLM);
– human resources management (HRM);
– preparation of CAD/CAM product models, etc.[6].

Currently, ERP systems contain a set of tools for planning material, financial, labor, and other costs; monitoring and interlinking strategic, tactical, and operational level plans; and means for analyzing planned and actual data.

Due to a wide range of functionalities, the use of ERP systems has long gone beyond industrial enterprises, as can be judged from numerous sources of information, including scientific articles. Today, ERP systems are used in construction [17], the garment industry [18], trade [19], logistics [20], in carrying out government defense orders [21], and more.

Over the past three decades, ERP systems have evolved and improved under the influence of various factors, as well as through research publications. Currently, a significant number of articles on ERP systems are being published in various scientific journals in Germany [22], India [23], Turkey [24], Russia [25], Ukraine [26], Belarus [27], and other countries. This demonstrates the growing interest of the scientific community in the use of ERP systems in various fields and the need for further research on this phenomenon. At the same time, scientists pay special attention to the problem of increasing the risks of cyber threats for ERP [28].

It is worth noting that, despite the existence of numerous articles on the automation of various fields [29; 30; 31; 32; 33; 34], there are almost no articles dedicated to the issue of improving the production process using ERP systems. Additionally, the concept of a modern ERP system remains poorly developed. A more in-depth analysis of the integration of

[4] MRP II technology was introduced in the 1980s.
[5] ERP (Enterprise Resource Planning).
[6] MRM (Manufacturing Resource Management); FRM (Financial Resource Management); CRM (Customer Relationship Management); SCM (Supply-Chain Management); SRM (Supplier Relationship Management); PLM (Product Life Cycle Management); HRM (Human Resource Management); CAD/CAM Interchange (Computer-Aided Design / Computer-Aided Manufacture).

digital technologies into the production process in the context of Russian ERP systems is also necessary.

Before we start discussing the methodological foundations of the production process, let's define the concept of «research methodology». Research methodology refers to the set of techniques, methods, and principles used to collect, analyze, and interpret data.

The systematization of data and structural-functional analysis served as the methodological basis for studying the essence, structure, and principles of organizing the production process. The search for methods to optimize the production process was carried out using the following tools:

– automation of processes (production management systems, introduction of robotic lines);

– theory of constraints (identification of bottlenecks);

– lean manufacturing (elimination of losses, defects, overwork of workers, redundancy of material and production stocks).

The balance and program-target methods were used to analyze the effectiveness of production planning.

The historical-economic and systematic approaches allowed for a more comprehensive understanding of the development of the ERP system concept. The analysis of scientific literature and data synthesis were used as the main research methods.

The methods of comparative analysis and data generalization revealed the versatility of ERP systems. The structural-functional and expert methods helped identify the leader of Russian ERP systems, the 1C:ERP software product, which offers the broadest functionality and the highest number of features.

Methodological foundations of the production process

Efficiency improvement of the production process should rely on the comprehensive application of modern production organization concepts [1, p. 87]. Production management is implemented through various tools, one of which is planning [35, p. 183]. Plans development is carried out in accordance with strategic goals and objectives, which are detailed at the tactical planning level and specified at the operational level. Planning the production process ensures coordination of the actions of production units responsible for executing specific tasks and the workers who resolve them. The business process of production is closely interconnected with the business processes of sales and procurement. This interconnection is clearly illustrated in Figure 1.

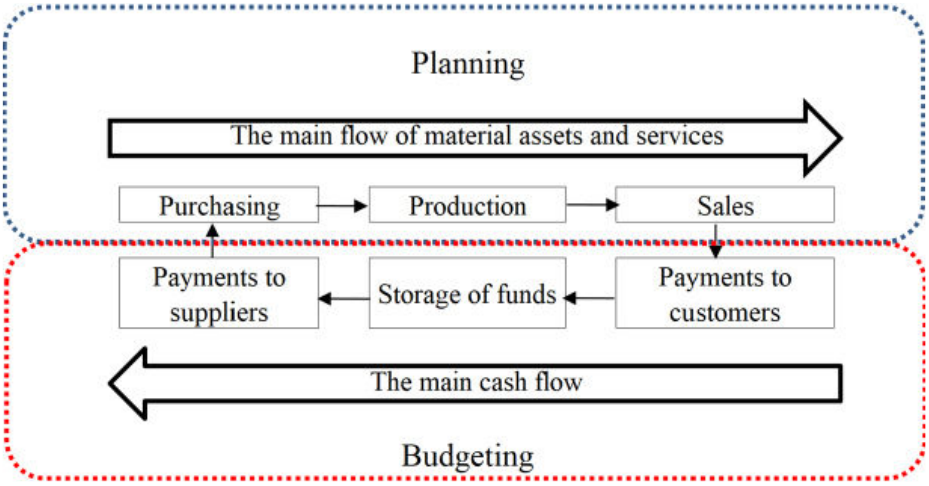

Figure 1 – Interconnection of production, sales, and procurement business processes [36, p. 96]

Management of the production process includes planning of material and financial flows, which requires coordination of production plans with financial and marketing[7].

Production plans are made in quantitative-sum and time expression, with the latter fixing the period of the plan's validity.

In periods of unstable economic situations, strategic production planning is carried out for a term of 1 year, while in conditions of stable economic conditions for 3 to 5 years. For industrial enterprises, a strategic plan may be drawn up taking into account the length of the production cycle. The planned indicators set at the upper level serve as target indicators for medium-level plans.

At the tactical (mid) level, production plans are made for each structural unit for a period of one year or one quarter. Medium-term planning is carried out in quantitative-aggregative terms with detailing by types of products.

At the operational level, plans are formed every month. Based on these, individual plans are created for performers, containing information about the time required for each technological operation. This approach allows for a comprehensive consideration of the production features in each structural unit and optimizes the product release process.

[7] Yakovlev, A. V. Production Management: Planning and Dispatching: e-book in pdf format / A. V. Yakovlev. – Moscow : 1C-Publishing, 2018. – 219 p.: ill., tabl. – (1C: Academy ERP). ISBN 978-5-9677-2760-3. P. 9.

The final stage of production planning is the verification of the compatibility of long-term, medium-term, and short-term plans, as well as their feasibility in terms of finances, materials, and labor costs. This process is accompanied by the identification and elimination of any deficiencies in material stocks, labor resources, and financial means. To ensure the execution of technological operations, the availability of equipment and the presence of workers with the required qualifications are analyzed. After reviewing and coordinating plans at all levels based on the Production Plan, data on the stock of raw materials and materials, and information on the volume of work in progress, a Procurement Plan is formed.

The approved mid-level production plans serve as the foundation for developing functional plans for technological processes, which include a work schedule for each piece of equipment involved, as well as the number of workers with indications of their qualifications. Additionally, shift and daily assignments are formulated for workers and teams. All of this requires a large number of calculations that can only be performed by specialized software.

The enterprise's activities are effective if the workload of work centers is managed with accuracy to the second. At the same time, there are no downtimes or overloads of production equipment and shop workers. Since various tools and equipment are used in the process of manufacturing products, and workers of different qualifications are involved, the process of optimal resource allocation is quite complex, which indicates the need for the use of an automated data processing system.

If a shortage of financial, material, or labor resources is identified during the planning process, production plans need to be revised and adjusted. A more extensive effort related to changing production plans will need to be made in the event of changes in demand conditions. Practice shows that the number of factors that exert a direct or indirect influence on the production process is very large; therefore, the procedure for adjusting production plans must be carried out repeatedly whenever a crisis event occurs.

Competent and well-considered managerial decisions can control the influence of internal factors. In the event of a destabilizing situation, the management staff can promptly respond to it. External factors cannot be managed; therefore, the leadership of the enterprise is required to make timely, balanced managerial decisions that can minimize production losses in the shortest possible time, which can be done by relying on current and complete information stored in a unified information space.

One of the significant factors influencing business activity is the competitiveness of products, which depends on their quality and cost. The prices of produced goods are calculated based on several indicators, the main one being the production cost. The value of production cost is affected by the prices of materials and their delivery, wages, depreciation expenses for production equipment, and others, as well as the technologies used in the production process. The introduction of advanced technologies in the production process, which allows for a reduction in the time required to produce goods, will also necessitate adjustments to production programs. The increase in production volumes, changes in product assortment, and the launch of new business directions without expanding its capacities will require a reassessment of both medium-term production plans and operational plans of structural divisions.

Adjustment of production plans will also be necessary in the event of emergencies, such as an extraordinary situation related to equipment failure. If it is not possible to carry out repairs in a timely manner, then the fulfillment of shift-daily tasks will be disrupted, which will lead to a failure to meet the production schedule.

Since the technological operations in the production process are closely interconnected, a breakdown of equipment in one workshop will affect the work of other structural divisions, which will again require a revision not only of the operational production plans but also of the inter-shop (tactical) level plans.

The success of solving such problems depends on the existence of a connection between production workers and the management staff responsible for coordinating production processes. The presence of feedback between employees at different levels allows management to quickly identify the depth of the problem, the complexity of its resolution, and to timely make changes to the production order of specific types of products, redistributing resources as necessary.

Management decisions are initiated at the upper levels and then communicated to specific performers. The frequency of adjusting production plans varies widely. Depending on the criteria for assessing consequences and the duration of technological cycles, a schedule for making changes to the production program is established (for example, once a month)[8].

The inability to resolve a problem at one level of planning leads to the necessity of addressing it at another – a higher level. When a problem transcends a single structural unit, centralized control and coordinated management of the production process are required.

The continuous monitoring of technological operations is carried out by the production dispatcher, who possesses a special set of tools for managing the technological process. Through dispatching, one can effectively manage production provided that data from lower levels is available, which is possible in an ERP system that has a unified information space.

[8] Yakovlev, A. V. Production Management: Planning and Dispatching: e-book in pdf format / A. V. Yakovlev. – Moscow : 1C-Publishing, 2018. – 219 p.: ill., tabl. – (1C: Academy ERP). ISBN 978-5-9677-2760-3. P. 15.

Methodological foundations of the application of ERP systems for effective management of the production process

The feature of ERP systems lies in their ability to comprehensively model business processes. The range of functional capabilities of ERP systems is extremely broad and diverse, which ensures a high level of automation in accounting, analysis, and control of all stages of the enterprise's life cycle. In ERP systems, the management of key business processes in production, sales, and purchases is automated. The success of production management depends on the results of the implementation of many simple interrelated business processes, which include management business processes:

– material supplies;
– internal movement of raw materials;
– equipment purchases;
– settlements with counterparties;
– hiring of employees;
– payroll calculations for the company's workers, etc.

To register events of the financial and economic activities of the enterprise, electronic documents that are part of various business processes are included in the ERP systems. At the moment documents are processed, the data contained in them goes into various registers, and the documents themselves are displayed in business processes as completed tasks[9]. The interconnection and mutual influence of documents are clearly visible in the route maps of the business processes (Figure 2).

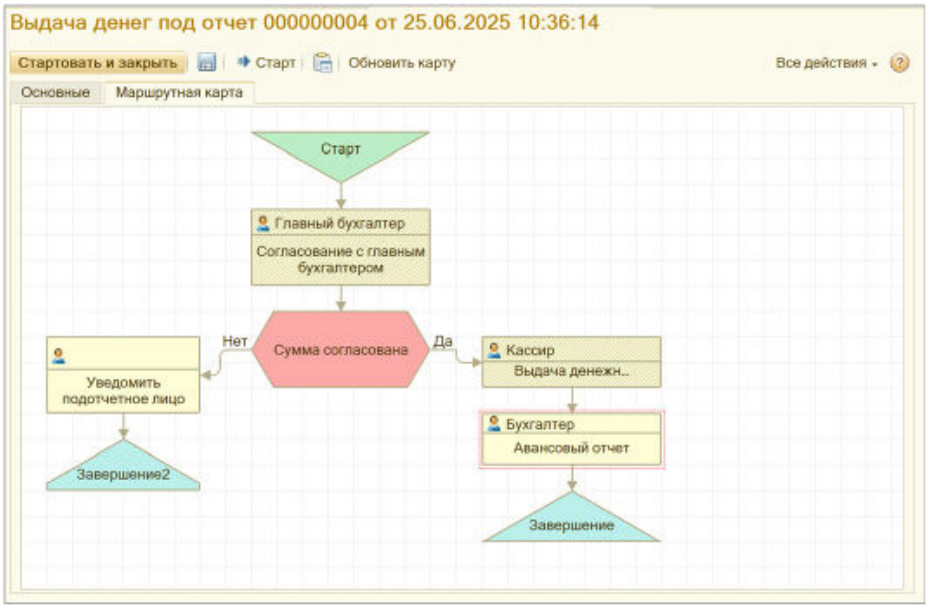

Figure 2 – Example of implementing a simple business process «Issuing money on account»

Each business process contains a sequence of documents in the order that the system must follow when recording events. Business process roadmaps contain the names of documents that must record the completed event, and information about the participants[10] responsible for carrying out the tasks. Once the business process is initiated, the system itself monitors user actions, granting access to some objects and blocking others until the previous event is completed.

The processing of the primary information entered by the user into the system is carried out automatically based on the algorithms embedded in it. This approach ensures accounting and control in automatic mode, significantly reducing the number of errors related to the human factor.

The synchronization of key business processes in ERP systems is carried out without the involvement of the system user by integrating business processes into a flow of sequential and interrelated tasks that must be performed by employees of various structural divisions. The effective implementation of business processes is ensured by the timely access to information about available resources.

Modern ERP systems have tools for automatic control of the main business processes of the enterprise at operational, tactical, and strategic levels. They include means for assessing the work of structural divisions and performers responsible for the stages of business process execution.

With the help of ERP systems, it is possible to analyze the chains of end-to-end tasks that include the interconnected and cyclical work of various departments of the enterprise. ERP systems have a number of characteristic features:

1. The presence of a unified information space containing subsystems for managing finances, sales, production, procurement, inventory, customer relations, personnel, payroll, treasury, budgeting, planning, and conducting managerial, accounting, and

[9] Completed tasks in the business process route map are marked with shading (Fig. 2).
[10] As a rule, the information about a business process participant is not a full name, but a position title.

tax accounting, etc. Most of the subsystems can operate autonomously, allowing for easy management of their connection or disconnection.

The work of users in a unified information space offers a number of advantages, one of which is the single entry of data into the system and its multiple use by various subsystems. Thus, when forming an order to the supplier, information about the counterparty is entered into the information database by the procurement manager. Later, this data will be used by accountants and warehouse workers. Information about the nomenclature, entered by employees dealing with the procurement and storage of material and production supplies, is later used by accountants, management personnel, specialists who form the specifications of the nomenclature, and other system users.

The second advantage of a unified information system is related to the location of all business processes within a cohesive database, which is extremely important given the close interconnection of key business processes.

The third advantage is the ability to use the ERP system as a single transactional system for business processes and numerous operations. For example, when creating a Production Plan, information is needed about:

– the number of semi-finished products in progress;

– the volumes of planned sales[11];

– the stocks of finished products in the company's warehouses.

That is, data will be needed from the production, sales, inventory, customer relationship management, human resources, treasury, and financial management subsystems.

2. Automatic organization of the information storage structure. The efficiency of the ERP system is achieved through the unification and clear structuring of the data processing processes that enter the system during document processing. The electronic document is the main object of the business process, and all other elements of the ERP system serve it:

– *directories and classifiers* perform auxiliary functions when filling out the particulars of documents. Their main purpose is to standardize data and reduce the time for entering information, minimizing the number of user errors;

– *accounting registers* are filled out at the moment of processing electronic documents and store information about the events of the economic business activities of the enterprise;

– *calculation registers* contain values of indicators calculated based on data obtained from documents;

– *reports* display consolidated and structured data in a format that is convenient for analysis and perception.

3. Keeping records in strict accordance with the legislation of the country in which the ERP system is used. Depending on who the developer of the ERP system is, the issues of compliance with legislation are addressed differently. When implementing a domestic ERP system, the enterprise does not need to take any actions, as the system is initially designed in strict accordance with the requirements of the legislation of this country in the field of accounting, tax, and personnel accounting. In addition, ERP systems also contain ready-made forms of accounting, tax, statistical, and other reporting for the Federal Tax Service, Pension Fund, Social Insurance Fund, and other governmental regulatory bodies.

Advanced ERP systems additionally provide users with special services that accelerate interaction with regulatory authorities, tax authorities, banks, and other counterparties. For example, the system «1C:ERP Enterprise Management 2» («1C:ERP EM 2») contains built-in services: «1C-Reporting», «1C-OFD», «1C:Counterparty», «1SPARK Risks», «1C-Takskom», as well as functional capabilities for direct data exchange with Sberbank of Russia and counterparties using software products from the company «1C».

When implementing a foreign ERP system, modification of the software product is necessary to comply with the requirements of the legislation of the country where it will be used, which is associated with additional financial costs and time expenditures related to the extension of the ERP system implementation period.

4. Availability of tools for accounting according to national and international standards. Enterprises operating abroad are required to maintain accounting records according to national standards and in compliance with international financial reporting standards. To maintain accounting records according to IFRS, ERP systems include specialized tools.

As is known, the rules for national and international accounting do not always coincide, but despite this, in ERP systems, accounting according to both standards is done correctly.

If an event is registered in the system that must be reflected equally according to the national accounting standards and IFRS, then when the document is processed, the program simultaneously creates entries in the accounting registers of national and international accounting. However, there are many cases where the same event must be reflected differently. For example, the accounting of fixed assets, the calculation of the cost of produced goods, etc. In Russian and international accounting, the registration of these events has significant differences.

For the correct reflection of these operations in the ERP system, the regular user does not need to perform any special actions. At the end of the

[11] The planned sales volumes contain information from customer orders and data on free demand.

reporting period, the IFRS specialist will transform the entered information using special processing and will populate the registers of international accounting with the modified data.

5. Availability of tools for comprehensive management of business processes at operational, tactical, and strategic levels. The activities of any enterprise begin with plans development. Typically, the Sales Plan is created first, followed by the Production and Procurement Plans. Due to the integration of strategic, tactical, and operational planning, production indicators in the ERP system can be created, controlled, and analyzed across various planning horizons in quantitative monetary terms. If necessary, planning can be carried out considering the scenarios of economic and political situation developments.

At each level of planning, the ERP system provides the ability to compare and analyze planned and actual indicators. In the event of emergencies, several alternative solutions can be quickly developed, and the most optimal option can be selected, after which a balanced and reasoned management decision can be made. Based on this decision, adjustments to the planned indicators are made. With the use of automation tools, the revised plans can be checked for feasibility at any time.

6. Support for multiple innovative technologies. Dynamically developing enterprises continuously expand their sales geography while increasing the volume and range of products manufactured. New areas of activity are launched to expand production, additional workshops are opened, and the number of employees increases. All of this necessitates connecting a larger number of users to the information base and processing the growing volume of data [37, p. 3820]. The changes occurring require the enhancement of the functional capabilities of ERP systems to address the assigned tasks.

During the emergence of new digital technologies, ERP systems have been intensively developing. Today, ERP systems can operate simultaneously with tens or hundreds of thousands of users, providing concurrent solutions to a large number of diverse tasks [38, p. 27]. The scaling of ERP systems is achieved through the use of client-server versions of the program, which allows for the automation of large business operations.

In the early 2000s, the possibility of remote connection for employees of holding companies to the unified information space of the ERP system emerged, which allowed staff located far from the headquarters to access the system. Remote access to the ERP system is provided via the Internet.

One of the highly-demanded innovative technologies used by ERP systems is the SaaS service[12]. Cloud technologies have found widespread application in various software products, including ERP systems. Currently, many companies are using cloud solutions. According to research findings obtained by B. A. Tukhbatullin and L. R. Nigmatzyanova [39, p. 324], in 2021, more than 27% of Russian enterprises used cloud solutions.

Despite the undeniable advantages of SaaS services, using software through the cloud has a number of disadvantages, one of the main ones being the critical dependence on the Internet. No Internet means no access to the system, which is unacceptable for manufacturing enterprises, as stopping production for even 1 minute will lead to huge losses. For this reason, the cloud version of ERP systems is used only for accessing the objects of subsystems such as "Regulated Accounting", "Personnel", "Fixed Assets", etc., that is, objects that are not critical to the uninterrupted operation of the Internet network.

Currently, there is a wide variety of ERP systems created by foreign and Russian companies. From the mid-1990s until 2022, Russian companies and holdings predominantly used foreign software products such as SAP, BAAN, Oracle, Microsoft, and others. In the first two decades of the market economy in the post-Soviet space, the most popular Russian ERP systems were "Galaktika ERP", "1C: Production Enterprise Management 8" ("1C: UPM 8"), "1C: ERP Enterprise Management 2", "1C: ERP Holding Management". In the Republic of Belarus, over the last two decades, the most popular software products have included SAP, FIS Global, Oracle, Fiserv[13], Microsoft, "1C: ERP Enterprise Management 2", Galaktika ERP[14], and others[15].

Historically, the first among Russian software products was the ERP system "Galaktika ERP", but

[12] SaaS (Software as a Service) is a model in which access to software is provided through the cloud. Purchasing a SaaS application is not the same as purchasing the software itself, but rather the access to it, which significantly reduces the cost of purchasing the software and managing the software and hardware infrastructure.

[13] Stay up-to-date with the latest trends. Overview of the global ERP solutions market. [Electronic resource]. – URL: https://www.eservice.by/rynok-erp-reshenij/ (Accessed 15.07.2025).

Tretyakova O. N. Practice and Prospects of Implementing SAP ERP in the Republic of Belarus. [Electronic resource]. – URL: https://elib.bsu.by/bitstream/123456789/150992/1/416-422.pdf (Accessed 15.07.2025).

Dovgyalo M.V. Prospects for the Implementation of ERP Systems in the Republic of Belarus. [Electronic resource]. – URL: https://elib.gstu.by/bitstream/handle/220612/11519/%20%20%20%20%20%20%20%20,%20%20.%20%20.%20%20%20%20%20%20%20%20%20%20%20%20....pdf?sequence=1 (Accessed 15.07.2025).

[14] About 5,000 Belarusian enterprises have automated their management systems. [Electronic resource]. – URL: https://banknotes.by/banknotes/banknoteshtml.php?r=site/read&titlid=okolo_5_tyis_belorusskih_predpriyatiy_avtomatizirovali_sistemu_upravleniya-45433&subject=all (Accessed 15.07.2025).

[15] Kastyukevich D. V. ERP systems: forecasting the main development trends. [Electronic resource]. – URL: https://libeldoc.bsuir.by/bitstream/123456789/40031/1/Kastyukevich_ERP_sistemy.pdf (Accessed 15.07.2025).

its market share in Russia was small, varying from 2 to 4%, and only in 2022 it reached 12% after the departure of foreign companies [40, p. 36].

The system "1C:Management of a Manufacturing Enterprise 8" appeared in 2004. Within just 3 years, its popularity sharply increased, reaching 14.4% in 2007 and 26% in 2010. The successor to "1C:UPP 8" was the system "1C:ERP Enterprise Management 2", followed by the software product "1C:ERP Holding Management". In 2020, the "1C:ERP" systems accounted for 39.2% of the Russian market, and since 2022, they have held more than 45% market share, with their popularity continuing to grow [40, p. 36].

Since 2018, there has been a trend in Belarus to transition from foreign software products to "1C:ERP"[16]. By early 2020, the ERP systems market in the Republic of Belarus looked as follows: 1C:ERP – 31%, SAP – 11%, Oracle – 8%, Galactica ERP – 6%, Microsoft – 4%, others – 40%[17]. For comparison, here are the figures for the Russian Federation during the same period: SAP – 42%, 1C:ERP – 39%, Microsoft – 7%, Oracle – 14.5%, Galactica ERP – 4%, others – 3% [41, p. 33].

As part of our research, we conducted a comparative analysis of the characteristics of the most popular ERP systems in Russia between 2003 and 2023 (Table 1).

Table 1 – Overview of the main characteristics of ERP systems that were most popular in Russia from 2003 to 2023

Characteristic	SAP ERP[18]	1C:ERP[19]	Oracle ERP[20]	The Galaxy Quantum. ERP[21]	Microsoft Dynamics 365[22]
Scope of application	holdings, large and medium-sized businesses	holdings, large and medium-sized businesses	Large business	large and medium-sized businesses	large and small and medium sized businesses
Scalability	+	+	+	+	+
Modular architecture	+	+	+	+	+
Customization	+	+	+	+	+
Process automation	+	+	+	+	+
Common database	+	+	+	–	+
Availability of mobile solutions	+	+	+	+	+
"Clouding"	+	+	+	+	+
Cross-platform	+	+	–	–	+
Flexibility and support for open source software	+/–	+	+	+	–
Analytics	+	+	+	+	+
Statutory compliance	+	+	+	+	+

[16] Stay up-to-date with the latest trends. Overview of the global ERP solutions market. [Electronic resource]. – URL: https://www.eservice.by/rynok-erp-reshenij/ (Accessed 15.07.2025).

[17] Kastyukevich D. V. ERP systems: forecasting the main development trends. [Electronic resource]. – URL: https://libeldoc.bsuir.by/bitstream/123456789/40031/1/Kastyukevich_ERP_sistemy.pdf (Accessed 15.07.2025).

[18] SAP: pluses and minuses. – URL: https://ruwest.ru/products/135682/ (Accessed 20.10.2025).

Advantages and possibilities of using the system SAP ERP. – URL: https://skyeng.ru/it-industry/it/preimushchestva-i-vozmozhnosti-sistemy-sap-erp/ (Accessed 20.10.2025).

[19] Competitive advantages 1C:ERP Enterprise management. – URL: https://v8.1c.ru/erp/preimushchestva/ (20.10.2025) Advantages of 1C:ERP. – URL: https://erp.is1c.ru/advantage (Accessed 20.10.2025), Russian ERP-systems 2025: rating, mode of operation, characteristics, peculiarities, function capabilities. – URL: https://q.diasoft.ru/mediacenter/news/rossiyskie-erp-sistemy-2025-reyting-printsip-raboty-kharakteristiki-osobennosti-funktsionalnye-vozmo/?ysclid=mgzbkxt9dd438794001 (Accessed 20.10.2025).

[20] Oracle Cloud ERP. – URL: https://gantbpm.ru/topics/oracle-cloud-erp/?ysclid=mgza3ntm7c802919137 (20.10.2025), Independent review Oracle Cloud ERP 2024. – URL: https://www.elevatiq.com/post/oracle-cloud-erp-independent-review/ (Accessed 20.10.2025).

[21] Advantages and disadvantages of the Galaxy system. – URL: https://www.klerk.ru/soft/articles/2050/ (20.10.2025), Galaxy Quantum. ERP to replace SAP. review TAdviser. – URL: https://itfederation.ru/news/galaktika-quantum-erp-na-zamenu-sap/ (Accessed 20.10.2025).

[22] Industry solutions of Microsoft Dynamics CRM. – URL: https://erp-crm-wms.ru/otraslevye-resheniya-microsoft-dynamics-crm/?ysclid=mgzewty1su292928005 (Accessed 20.10.2025).

Innovation (AI, big data analysis, etc.)	+	+	+	no data	+
Submission of reports in electronic form	+	+	+	–	+
Data exchange with counterparties	+	+	+	no data	+
A cloud-based platform for interacting with government information systems	+	+	+	–	+
Availability of purpose-built solutions	No data	9	several dozen	9	6
Number of industry-specific solutions	6	89	12	6	11
Terms of implementation	6-12 months, up to 2 years for large projects	9-12 months	from several months to 1 year	from several months to 1 year	3-6 months, 8-10 months at production facilities.
Cost of license, (user/month)[23]	from $150	from $1	from $80	from $60	from $8
Security level	high	high	high	high	high
Combining all business processes into a single platform	+	+	+	+	+
Global application	in companies all over the world	mass use in Russia and the CIS countries, and successful implementations in European and Asian enterprises	supports work in more than 85 countries	widespread use in Russia and Belarus	supports operations in more than 190 countries
System support and maintenance	+	+	+	+	-/+

The analysis of the data in Table 1 showed that 1C:ERP can successfully compete with the SAP ERP system in almost all areas, and in some areas it can even lead. For several decades, SAP ERP has been a recognized as a global leader in enterprise software. Since the early 2000s, SAP ERP has accounted for about 50% of the Russian ERP system market, but on December 31, 2023, SAP disconnected Russian customers from its software support, and on March 20, 2024, it also closed access to its cloud services, prompting Russian companies to consider switching to domestic software products.

Currently, there is a wide variety of Russian ERP systems: Lexema ERP, Odoo, ERP Monolith, Parus ERP, RosBusinessSoft ERP, SBC-Enterprise, X24, ERPNext, Compass, Turbo ERP, Sage ERP X3, My-Company, Dolibarr, Ma-3, Orbox, and NERPA ERP [29, p. 37]. According to the results of a study by the St. Petersburg IT Directors Club (SPB CIO Club), the most popular Russian ERP systems in 2025 were: 1C:ERP (92%), Digital Q.ERP (86%), Global ERP (77%), Turbo ERP (64 %), Visary ERP (59 %), Galaxy ERP (59 %), Lexema-ERP (58 %), ERP Monolith (56 %), Parus (52 %)[24] . The rating of ERP systems was calculated using a normalized scale and represented the ratio of the number of positive characteristics of solutions to the total number of characteristics.

The results of our research showed that 1C:ERP software products are leading not only in the Russian

[23] Detailed comparative analysis of six popular ERP systems: 1C ERP, Odoo ERP, Digital Q.ERP, SAP, Oracle ERP and Microsoft Dynamics 365. – URL: https://vk.com/@760823033-podrobnyi-sravnitelnyi-analiz-shesti-populyarnyh-erp-sistem (Accessed 20.10.2025).

[24] Russian ERP systems 2025: rating, operating principle, characteristics, features, functionality. – URL: https://q.diasoft.ru/mediacenter/news/rossiyskie-erp-sistemy-2025-reyting-printsip-raboty-kharakteristiki-osobennosti-funktsionalnye-vozmo/ (Accessed 20.10.2025).

market, but also in neighboring countries, which was the main reason for studying their functionality.

1C:ERP is a generic name for a group of software products created on the 1C:Enterprise 8.3 platform. 1C:ERP includes 1C:ERP Enterprise Management 8, 1C:ERP Holding Management, and 1C:ERP WE (World Edition)[25].

1C:Enterprise 8.3 is an open system that allows integration with virtually any external software and hardware. It provides tremendous opportunities for continuous improvement of 1C:ERP, which is an important competitive advantage, especially during the period of mass transition of companies from foreign ERP systems to Russian ones.

As a cross-platform software product, 1C:ERP can run on various operating systems: Windows, Linux, Elbrus 7.0, MacOS, and IOS. It supports database management systems such as PostgreSQL, MS SQL Server, IBM DB2, and Oracle Database, and can be easily customized to meet the specific needs of business processes. The wide range of database management systems and operating systems that 1C:ERP can run on also contributes to the growing popularity of 1C's ERP systems.

It is also important to note that there are various ways to connect to the information base. You can access 1C:ERP using a web client, desktop client, or mobile applications. The web client works through Internet Explorer, Safari, and Mozilla Firefox browsers. In desktop client mode, the platform supports working with 1C:ERP on Windows, Linux, and Elbrus 7.0. It can also be accessed from mobile devices running Windows, iOS, and Android operating systems.

■ RESULTS

"1C:ERP Enterprise Management 2" is the flagship solution of the company "1C" and belongs to international-class ERP systems, which are actively used both in Russia and abroad. The application solution "1C:ERP EM 2" is built on the platform "1C:Enterprise 8.3", which supports more than 20 languages: Russian, English, Bulgarian, Hungarian, Vietnamese, Greek, Spanish, Italian, Chinese, German, Polish, Romanian, Turkish, French, and almost all languages of the former Soviet socialist republics.

The wide functional capabilities of "1C:ERP Enterprise Management 2" allow it to confidently lead not only among Russian ERP systems but also internationally. The only exception is the ERP system of the German company SAP, which had a market share of 49% at the time of its exit from the Russian market, followed by "1C:ERP EM 2" with 33.4%, while the remaining 17.6% accounted for other ERP systems.

The presence of a large number of specialized solutions such as PDM, EAM, CRM, SCM, SRM, PLM, HRM, ITIL, PMO, ESB, GIS, etc., which expand the functionality of "1C:ERP Enterprise Management 2", enables large and medium-sized businesses[26] to achieve significant economic effects, improve labor productivity, reduce costs, and increase profits.

"1C:ERP Management of the Enterprise 2" is a comprehensive information system for business management, allowing for timely and correct managerial decisions based on current, complete, and consistent information; effectively control all business processes of the enterprise; and ensure the efficiency of activities of employees, structural divisions, and the enterprise as a whole.

Initially, the creation of "1C: ERP" was aimed at developing a system that automates the activities of manufacturing enterprises. Currently, the areas of application for "1C: ERP Management of Enterprise 2" and "1C: ERP Management of Holding" are quite diverse, as evidenced by the information from the diagram presented in Figure 3.

The special demand for the "1C: ERP Enterprise Management 2" system in the post-Soviet space and far beyond is due to the wide range of functional capabilities that allow for the automation of the activities of any economic entity, taking into account the specifics of its operations.

In addition to the aforementioned functional capabilities, the "1C:ERP UII 2" system includes numerous innovative technologies that provide users with additional services. For instance, the "Production Management" subsystem features tools for managing production based on "bottlenecks", alongside three-level planning of the production process, managing the load of work centers, operational dispatching of production, etc. It ensures coordination of inter-shop

[25] Feature set of 1C:ERP Enterprise Management 2 and its local versions is divided into two components: «operational» and «regulated.» The first component is independent of the legislation of the country where 1C:ERP Enterprise Management 2 is used, while the second component is regulated by the legislation of that country. Currently, localized versions of 1C:ERP Enterprise Management 2 exist only for Russia, Belarus, and Kazakhstan, while non-localized versions are used in other countries.

[1]C:ERP WE (World Edition) – delocalized system solution «1C:ERP», adapted to the specific accounting requirements of foreign countries. In the de-localized versions, the «operational» feature set is implemented using 1C:ERP UP 2, while the «regulated» feature set is implemented using 1C:Accounting 8 (if available for the country) or another national software product that automates accounting. For more information, please visit the 1C website (URL: https://v8.1c.ru/erp/1s-erp-we/?).

[26] The 1C:ERP: Enterprise Management 2 system was originally created to automate the activities of large companies. Currently, some medium-sized enterprises have also automated their activities using 1C:ERP Enterprise Management 2. The use of 1C:ERP Enterprise Management 2 in small businesses is considered impractical due to the high cost of purchasing, implementing, and supporting this software product. The redundancy of the feature set of 1C:ERP UP 2 for small enterprises is another good reason for the system's unpopularity in this sector of the economy. For the automation of small and medium-sized businesses, the 1C company offers the software product 1C:Management of Our Company (1C:UNF), which is considered a mini ERP. 1C:UNF automates the management of sales, production, and procurement business processes. Our company's management contains a large number of tools for conducting comprehensive management accounting, but the possibilities for conducting accounting and tax accounting are limited.

transitions at the operational level, provides tools for flexible production management, controls the plans for the release of semi-finished products and products, and offers a convenient scheme for plan substitution.

Figure 3 – Application areas of 1C:ERP together with the names of the largest companies that use it in their activities[27]

As mentioned above, the planning procedures begin with the formation of the Sales Plan, based on which the Production Plan is created, and then the Raw Material and Material Procurement Plan is developed. Since it is necessary to specify the names of products, semi-finished products, components, raw materials, and materials when entering planned data into the "1C:ERP Enterprise Management 2" system, it is recommended to enter all information about the nomenclature in advance.

In "1C:ERP UP 2", production planning can be carried out based on established norms for the consumption of material and production resources and standards for labor costs in the manufacturing of each product. This information is stored in the specifications of the nomenclature. Before entering data on resource specifications, it is also necessary to fill in details about the labor resources involved in production. Based on the data indicated in the specification, the system automatically performs the calculation, the result of which includes the calculated values of the planned product cost, a list of material and labor costs, and their quantities.

Due to the fact that resource specifications contain information about materials, semi-finished products, and work, in "1C:ERP" it is possible to create a "Procurement Plan" document based on the "Production Plan" document. For the automatic filling of the Procurement Plan, the system will automatically perform the operations of ungrouping semi-finished products and grouping material and production stocks, and then calculate the quantity of each material required for the production of the specified product.

If a phased production method is used at the enterprise, it is also necessary to enter information about the stages, the order of their execution, responsible departments, work centers, and the duration of each stage when filling out the resource specification. The management of the production stages is carried out by operational-level managers. The ERP system provides special tools to control the performance of production and operational tasks, monitor the progress of technological stages, track orders for processing, assembly/disassembly, products manufacturing, and more (Figure 4).

The ERP system provides middle management with tools for monitoring the flow of business processes and controlling the areas of activity for which they are responsible. Through numerous and diverse reports, management personnel are able to analyze current performance indicators, their dynamic pattern, and use either a brief or a comprehensive data presentation format.

A tool called "Manager Monitor" (Figure 5) has been created for senior management, displaying the values of various indicators. The composition and number of these indicators are determined by the manager. With their help, he can analyze the current state of the business; use various horizons and planning scenarios; and assess the prospects for the company's development.

[27] Slide from the presentation of the CEO of 1C at the XXV International Scientific and Practical Conference "New Information Technologies in Education". Integration of the IT industry and the education system based on 1C technological solutions – a growth strategy. February 4, 2025. – URL: https://events-files.1c.ru/npk25/section_files/section-id%232/npk25_presentation.pdf (Accessed 20.06.2025).

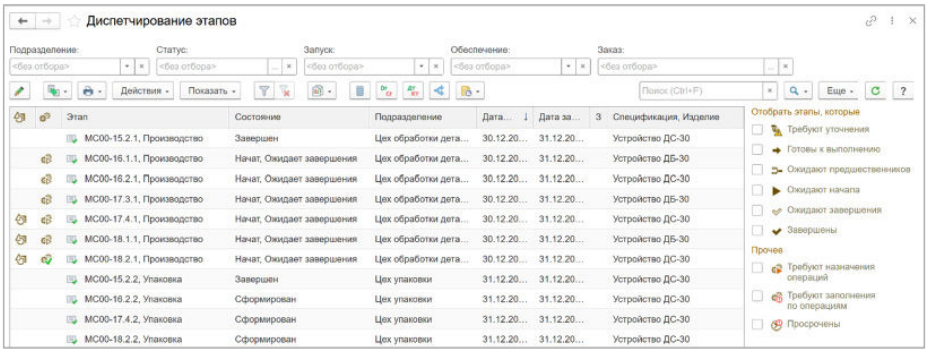

Figure 4 – Stage Dispatching tool for monitoring production processes

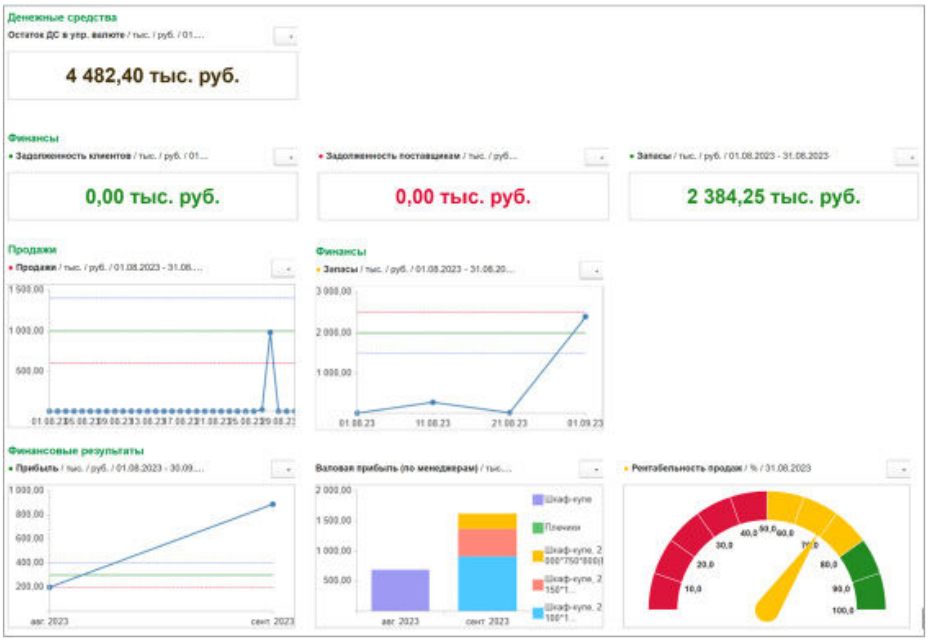

Figure 5 – Target Indicator Monitor

Considering that a large number of digital technologies, including Mobile Technology, are integrated into the "1C:ERP Enterprise Management 2" system, managers at all levels can connect to the information database at any time using a mobile device, analyze the state of various economic indicators, make informed management decisions, and communicate them to the executors.

In the context of an unstable global economic situation, there is often a need to adjust planned indicators. In medium-term planning, production plans are created based on statistical data from previous periods, broken down by quarters or months, while in operational planning, they are broken down by decades, weeks, or days.

A sharp change in the economic condition of the enterprise necessitates an urgent assessment and revision of plans for the next few months. Often, when adjusting plans, "rolling" planning is employed, which involves analyzing the results of the enterprise's activities for the current period and changing plans for the next 3 months (not necessarily aligning with the quarter).

In August 1998, an economic crisis occurred in Russia, the negative impact of which was felt by all economic entities, regardless of their size and type of activity, which required company management to make prompt managerial decisions to save their businesses. After analyzing key business processes, most industrial enterprises found it necessary to adjust their production plans for the next 3 months (September, October, November). At the end of September, company management, analyzing the results of production activities and the consequences of the economic crisis, concluded that it was necessary to adjust the plans for the subsequent 3 months. This procedure was repeated for several months until the economic situation stabilized.

Currently, "rolling" planning is also in demand in the management of production processes. The "1C:ERP Enterprise Management 2" system includes a set of tools for implementing "rolling" planning, the use of which does not require significant effort from experts.

Production plans can be monitored with precision down to the day, which allows for a rapid response to

events that pose threats to the normal operation of the enterprise.

In "1C:ERP UP 2", production management is carried out using the following tools:

– *Management of product data*. The system has established a unified information space for the data necessary to coordinate the manufacturing process. Resource specifications define the normative needs for material and labor resources (see Fig. 6) and describe the manufacturing process of the product in stages[28]. Production stages can be detailed in terms of technological operations.

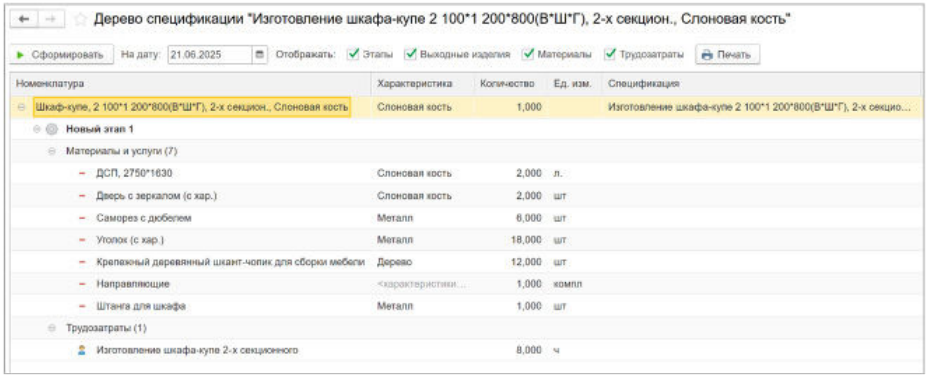

Figure 6 – Product specification tree for a "Two-unit sliding door wardrobe"

– *Management of production orders*. "1C:ERP Enterprise Management 2" allows for three-level production management: planning and grouping of product requirements, inter-shop management, and management at the level of the business unit.

– *Production schedule development*. When creating the production schedule, customer orders, internal orders, stock levels of products in warehouses, sales and production plans, as well as delivery times for orders are analyzed. Based on this data, the needs for raw materials, components, and supplies are determined. To optimize inventory levels, the 'just-in-time' approach is used in the "1C:ERP UP 2" system. According to this approach, the enterprise's material stock is "maintained at the level necessary for the production of goods according to already received orders" [42, p. 354]. Having information about the consumption dates of certain materials allows for purchasing them directly before the scheduled production date. Production schedules help achieve a more optimal distribution of labor resources taking into account the workers' qualifications.

– *Step-by-step planning*. If an enterprise employs a phased production approach, the production schedules must contain information about what tasks need to be performed at each stage of production. In this regard, step-by-step planning is carried out using MES system tools. The local dispatcher, who coordinates the phased production, monitors the resource provision for each stage, optimizes the load of work centers, and creates a balanced schedule for performance. "1C:ERP Enterprise Management 2" is an effective assistant for the local dispatcher, providing convenient tools for automating the shift tasks control.

In conclusion, we note that for the implementation of the Production Plan, an analysis of the accounting registers filled in during the processing of documents of the inventory management and procurement subsystems is necessary. By using a single database, access to and exchange of information stored in different accounting registers occurs as quickly as possible without human involvement. The consistency of strategic, tactical, and operational plans for managing finance, production, procurement, sales, and employee activities allows for effective control of the entire enterprise [43, p. 17].

The use of ERP systems in the production process allows for increased speed and quality of management decisions, enhances labor productivity through the active use of advanced digital technologies, minimizes production costs, and helps develop balanced and justified management decisions for opening new areas of enterprise activity and for the development of existing ones.

By using a unified information space, the ERP system, being a self-sufficient entity, is capable of solving tasks of varying complexity, providing managers with convenient and effective tools for successful business management.

■ DISCUSSION

During the period of rapid development of digital technologies and their active introduction into the sphere of production, there has been a noticeable increase in "interest in a radical revision of the existing tools, taking into account the approaches of innovative development" of business [44, p. 98]. The use of modern information and analytical systems, breakthrough production technologies, the productive use of big data technologies, digital twins, radio frequency identification, mobile technologies, cloud computing, etc. contributes to the improvement of the efficiency of the production process and its successful development.

[28] In the demonstration example, the product is manufactured in one step.

ERP systems provide a set of tools for solving a wide range of different tasks related to improving the efficiency of the production process. They allow you to:

– quickly search for optimal organizational solutions;

– establish patterns for implementing production processes;

– apply universal methods for smoothly transitioning from one type of product to another;

– create interconnected levels of labor organization for blue-color workers, teams, workshops, and departments.

According to the results of the InfoSoft8 study, the following changes were identified in large Russian companies after automating their production processes using 1C:ERP:

– reduction of material stocks in the company's warehouses by 19%;

– reduction of expenses related to the purchase of raw materials and supplies by 15%;

– increase in the turnover of material and production stocks by 25%;

– reduction of production costs by 15%;

– reduction of production costs by 8%;

– increase in production volumes by 25%;

– reduction of production defects by 17%;

– increase in labor productivity of blue-color workers by 22%.

These changes indicate that the use of modern ERP systems, combined with integrated digital technologies, significantly increases the efficiency of the production process by optimally distributing and utilizing financial, material, and labor resources.

Based on the results of our research, we have developed a realistic and strategically feasible production management concept that includes:

– rational use of labor, material, and financial resources;

– cost reduction without compromising product quality;

– elimination of all types of losses;

– customer satisfaction with the price and quality of products;

– increase in production volumes through innovative production management using advanced information and analytical systems in close cooperation with modern digital technologies.

This concept can be successfully implemented using both 1C:ERP and advanced domestic ERP systems, such as Digital Q.ERP, Global ERP, Turbo ERP, Visary ERP, Galaxy ERP, Lexema-ERP, ERP Monolith, Parus, and others.

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