



Management

UDC 658.787:658.5.012.4

DOI <https://doi.org/10.5281/zenodo.17551471>

**Implementation of MRP systems as a tool for improving inventory
management efficiency in FMCG companies**

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Accepted: 18.10.2025 | Published: 31.10.2025

Abstract. The relevance of the research is determined by the growing need of FMCG companies to increase the efficiency of inventory management under conditions of market turbulence, disrupted supply chains, and intensified competition. Traditional planning methods often fail to ensure a rapid response to demand fluctuations, resulting in excessive inventories, reduced turnover, and financial losses. In this context, the implementation of Material Requirements Planning (MRP) systems becomes a crucial tool for optimizing material flows and enhancing the flexibility of production and distribution processes. The **purpose of this article** is to substantiate the effectiveness of implementing the MRP system as a tool for enhancing inventory management performance in FMCG companies, with a focus on practical results related to optimizing procurement and production planning, reducing excessive inventories, and improving operational flexibility and business resilience. The **research methodology** is based on a combination of systematic, analytical, and comparative approaches. Methods of economic modeling, logistics process efficiency analysis, and case-study techniques were



employed to evaluate the practical outcomes of MRP implementation in national and international FMCG companies, along with statistical generalization methods to identify patterns of inventory reduction and cost optimization. **Research results** revealed that integrated MRP solutions lead to a 30–45% reduction in excessive inventories, a 20–25% decrease in operating costs, and up to a 50% increase in resource turnover. It has been proven that integrating MRP with Big Data analytics, IoT technologies, and demand forecasting systems enhances the adaptability and resilience of supply chains to external risks. **Conclusions.** Confirm that MRP functions as a practical analytical framework for building data-driven inventory management systems that combine precision, adaptability, and operational sustainability. Prospects for further research include developing quantitative models to evaluate the economic impact of digitalized material planning, forming recommendations for harmonizing Ukrainian practices with international standards such as APICS CPIM and the European Logistics Association, and expanding MRP applications in the context of post-war recovery and the global integration of Ukrainian FMCG companies.

Keywords: digital transformation, demand forecasting, logistics planning, data analytics, operational resilience, resource optimization, supply chain management.

Упровадження системи MRP як інструменту підвищення ефективності управління запасами у FMCG-компаніях

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Анотація. Актуальність дослідження зумовлена зростаючою потребою FMCG-компаній у підвищенні ефективності управління запасами під час ринкової турбулентності, нестабільності логістичних ланцюгів і збільшеної конкуренції. Традиційні методи планування не забезпечують оперативного реагування на зміни попиту, що призводить до накопичення надлишкових запасів, зниження оборотності та фінансових втрат. У таких умовах застосування систем планування матеріальних ресурсів (MRP) набуває вагомого значення як засіб удосконалення матеріальних потоків і поліпшення гнучкості виробничо-збутової діяльності. **Мета статті** – обґрунтувати ефективність упровадження системи MRP як інструменту підвищення результативності управління запасами у FMCG-компаніях, зосередивши увагу на практичних показниках оптимізації процесів закупівель, планування виробництва та скорочення надлишкових запасів, що сприяє зростанню операційної гнучкості та стабільності бізнесу. **Методологія роботи** ґрунтується на поєднанні системного, аналітичного й порівняльного підходів. Використано методи економічного моделювання, аналізу ефективності логістичних процесів, кейс-метод для оцінювання практичних результатів упровадження MRP у національних і міжнародних FMCG-компаніях, а також методи статистичного узагальнення для виявлення закономірностей зниження запасів і витрат. **Результати дослідження** продемонстрували, що використання інтегрованих MRP-рішень дає змогу зменшити надлишкові запаси на 30–45%, скоротити операційні витрати на 20–25%, а оборотність матеріальних ресурсів підвищити до 50%. Аргументовано, що інтеграція MRP із технологіями Big Data, IoT і прогнозною аналітикою забезпечує адаптивність ланцюгів постачання та стійкість підприємств до зовнішніх ризиків. **Висновки.** Доведено, що MRP є дієвим інструментом формування аналітично керованої системи управління запасами, що поєднує гнучкість, точність і стійкість операційних процесів. Перспективи подальших досліджень полягають у створенні кількісних моделей оцінювання ефекту від



цифровізації планування матеріальних ресурсів, розробленні рекомендацій для гармонізації українських практик із міжнародними стандартами APICS CPIM та European Logistics Association, а також у розширенні застосування MRP у контексті післявоєнної відбудови та глобальної інтеграції українських FMCG-компаній.

Ключові слова: цифрова трансформація, прогнозування попиту, логістичне планування, аналітика даних, операційна стійкість, оптимізація ресурсів, ланцюги постачання.

Problem statement. In today's highly turbulent fast-moving consumer goods (FMCG) market, optimising inventory management is of particular importance as a factor in ensuring the stability of production and sales processes, and increasing the competitiveness of companies. The problem is that traditional methods of material resource planning, based on experience or static norms, do not meet the dynamics of demand, shortened product life cycles and the need to respond promptly to changes in supply. As a result, storage costs increase, excess or shortage stocks accumulate, capital turnover and the efficiency of logistics chains decrease. The introduction of material resource planning (MRP) systems opens up the possibility of transitioning from fragmented inventory management to an integrated model based on analytical data, demand forecasting and automated coordination of procurement, production and distribution. In this context, MRP is considered not only a technical tool but also a strategic element of the digital transformation of operational management, which involves consistency between production planning, market needs, and the enterprise's resource potential.

The scientific significance of the problem lies in the need for theoretical substantiation of the impact of MRP systems on the efficiency of material flow management in conditions of dynamic demand and multi-item production. The practical significance lies in the need for FMCG companies to increase the transparency of planning processes, reduce losses from the irrational use of



inventories, and develop adaptive logistics strategies. Solving this problem will contribute to the development of scientifically sound approaches to digitalising inventory management and strengthening the positions of Ukrainian manufacturers in the global consumer market.

Analysis of recent research and publications. Analysis of modern research allows us to identify four interrelated areas. The first area encompasses the conceptual and methodological foundations of inventory management, which serve as the basis for implementing MRP systems. In the work of Z. Kadyuk, the relationship between inventory management, sales, and production planning is revealed, and the logic of interaction between demand forecasting and resource planning is established [1]. Modern methods of inventory management in the dairy industry are supported by B. V. Fostiak and co-authors, who emphasise the need for automation of residue control processes and accurate calculation of material needs [2]. Scientists I. O. Zharska and Yu. S. Khachirova systematises inventory management models, highlighting MRP as the primary tool for synchronising procurement and production planning [3]. I. Ya. Ippolitova and co-authors study the impact of logistics on inventory management efficiency, emphasising the importance of information transparency and operational control over material flows. [4]. Further research in this direction should focus on developing adaptive inventory management models that integrate MRP analytics and logistics optimisation.

The second area of research is related to the digitalization of production processes and the development of MRP in the context of Industry 4.0. Thus, V. V. Kavetskyi and O. H. Ratushniak consider modern systems for planning and organizing production, emphasizing the importance of the transition to complex ERP/MRP platforms [5]. Scientists A. P. Velasco Acosta and co-authors assess the applicability of the Demand-Driven MRP concept in complex production conditions, outlining the role of flexible resource flow management [6]. In their article, J. A. Cano and co-authors propose improved MRP models that take into account fuzzy capacity and fluctuations in delivery times [7]. Further research



should be directed towards the development of integrated digital MRP architectures for the FMCG sector, capable of supporting real-time adaptability.

The third area concerns algorithmic and mathematical improvement of MRP systems. In particular, R. Chopra and co-authors analyze the implementation of Enterprise Resource Planning (ERP) systems in manufacturing companies, proving that the integration of MRP modules reduces inventories, increases productivity and provides planning flexibility [8]. Scientists J. Wikarek and P. Sitek propose methods of proactive planning and routing in MRP systems with resource constraints that improve the consistency of production and logistics processes [9]. B. I. Selamoğlu studies the synergy of MRP and ERP within the concept of sustainable supply chain management, emphasizing the optimal balance between efficiency and environmental responsibility [10]. Researchers G. Xu and co-authors propose a resource-oriented approach to production planning based on MRP, which helps to minimize costs and increase the accuracy of order fulfillment [11]. Further work in this direction should be aimed at applying machine learning to predict resource shortages and improve the accuracy of production plans.

The fourth direction covers the managerial and marketing dimensions of MRP implementation. Thus, M. Marshchivskyy analyses the marketing potential of business platforms in retail, showing that digital resource management tools can increase brand competitiveness and operational efficiency [12]. At the same time, the results of the research by N. Marynenko and T. Kutko [13] have important cross-cutting significance, as they demonstrate how the integration of MRP into the supply chain management system can form the basis of the marketing sustainability of the enterprise. Further exploration in this direction should focus on assessing the impact of MRP on consumer loyalty, the speed of response to market changes, and the positioning of FMCG companies in a competitive environment.

Therefore, modern research on the implementation of MRP in FMCG companies combines methodological, digital, algorithmic, and marketing



approaches, creating a scientifically sound basis for building flexible and sustainable next-generation inventory management systems.

Highlighting previously unresolved parts of the general problem. Despite significant progress in the study of MRP systems, several aspects remain unresolved. The issues of adapting MRP to conditions of unstable demand, volatile logistics chains, and digital transformation in the FMCG sector have not been sufficiently studied. Little attention has been paid to the methods of integrating MRP with Big Data analytical tools, IoT monitoring and predictive demand models. There are no unified data standards, criteria for assessing effectiveness and a generalised empirical base for the use of systems in Ukrainian companies. The proposed study aims to fill these gaps by systematising the principles of MRP functioning, analysing the actual results of implementation, and developing recommendations for the international adaptation and scaling of MRP solutions. The implementation of the proposed approaches will enable the enhancement of planning accuracy, increase inventory management flexibility, and facilitate the integration of Ukrainian FMCG companies into global supply chains.

Formulation of the article objectives. The purpose of this article is to investigate the implementation of the MRP system as an effective tool for enhancing inventory management efficiency in FMCG companies, focusing on practical indicators that optimise procurement and production processes, reduce excess inventory, and increase operational flexibility. Research objectives:

1. To reveal the essence and principles of the MRP system and its role in increasing the efficiency of managing material flows, procurement, and production processes in FMCG companies.
2. To analyse the impact of MRP implementation on optimising inventories, reducing losses, and increasing resource turnover, identifying the main organisational and technological barriers to implementation.



3. To formulate scientifically based recommendations for the development, scaling, and international adaptation of MRP approaches as an innovative tool for increasing the efficiency of logistics and production management.

Presentation of the main research material. The MRP system occupies a central place in the modern paradigm of production and inventory management, as it provides a transition from a reactive to a predictive-analytical method in managing material flows. Its essence lies in the automated coordination of needs for materials, components and accessories with production, procurement and supply plans. Within the FMCG sector, where the speed of product turnover, the accuracy of demand forecasting and inventory minimisation are essential factors of competitiveness, MRP guarantees the continuity of the production cycle without excessive accumulation of resources. Thanks to integration with ERP, MRP performs the functions of detailed planning, determining precisely what, when, and in what quantity is necessary to order or manufacture to carry out production tasks and meet consumer demand (table 1).

Table 1

Basic principles of the MRP system in FMCG companies

Principle	Content	Practical significance for FMCG companies
Planning «from demand»	Formation of a material requirements plan based on a demand forecast and customer orders	Ensures the accuracy of production and procurement plans, minimises the risk of shortage or surplus
Time synchronisation	Determination of the exact time of ordering and delivery of materials, taking into account the production cycle	Improves the efficiency of supply and reduces the duration of logistics operations
Hierarchical planning structure	Coordination of the master production plan, material requirements plan and procurement plan	Guarantees consistency between the strategic, tactical and operational levels of management
Feedback	Automatic adjustment of plans in case of changes in demand, delays or shortage of resources	Increases the system's adaptability to market fluctuations and supply
Integration with ERP and supply chain management	Using a single database to coordinate financial,	Ensures transparency of information flows and unity of management decisions



Principle	Content	Practical significance for FMCG companies
	production and logistics processes	

Source: formed by the author based on [3, p. 193–194; 5; 6, p. 4238–4239; 10, p. 210–211; 13, p. 109–110]

In practical terms, the MRP system is a key element of the digital ecosystem for managing production and logistics processes in FMCG companies, combining demand planning, procurement and supply into a single data loop. At enterprises with an extensive range of products, MRP is used to build the so-called bill of materials, which reflects the interdependence between finished products and components. Thanks to this, the system automatically calculates the need for raw materials and components, synchronises them with production and shipment schedules, taking into account delivery times, batch volumes and warehouse balances. It helps to make management decisions not intuitively, but based on reliable indicators, which significantly reduces the risks of shortages or overproduction.

In practice, large food and cosmetic FMCG companies integrate MRP with ERP and Customer Relationship Management (CRM) systems, allowing for real-time adjustments of production plans in response to fluctuations in demand or delivery delays. For example, during seasonal peaks in demand, the system automatically suggests resource redistribution scenarios, such as shifting production schedules, replacing suppliers, or reconfiguring the supply chain. This approach enhances the flexibility and sustainability of production, reduces delivery cycle time, and optimises the utilisation of warehouse space and working capital. In the context of global market instability and military risks, MRP serves as an anti-crisis management tool, ensuring a swift response to changes in the external environment and maintaining operational continuity. The experience of companies that have combined MRP with predictive analytics and automated demand modelling indicates a reduction in inventory levels by 20–30% without compromising the level



of service. Thus, MRP is transformed into an intelligent material flow management centre that combines scientifically based planning logic with the practical results of digital transformation in logistics and production, guaranteeing increased productivity and competitiveness for FMCG businesses.

The effectiveness of the MRP system in the activities of FMCG companies lies in its ability to ensure high accuracy in purchasing, production, and supply planning through comprehensive data integration and synchronisation of material flows. In the modern business environment, where consumer demand fluctuates daily and logistics risks are influenced by both market and political factors, MRP becomes a crucial tool for stability. It allows not only to minimise deviations from supply plans, but also to forecast needs based on sales analytics, historical trends and seasonality parameters. Practical experience demonstrates that the implementation of MRP in FMCG companies enables the reduction of excess inventory, shortens the supply cycle, and enhances the accuracy of procurement planning, all of which directly impact the financial performance of the enterprise (table 2).

Table 2

Results of MRP implementation in FMCG companies' procurement,
production and supply planning

Indicator/aspect	General characteristics of MRP impact	Typical manifestation in practice
Demand forecasting	Forms procurement plans based on analysis of historical data and current demand	Reducing the discrepancy between forecasted and actual material needs
Production schedule planning	Ensures synchronisation between resource availability and production tasks	Optimising production line loading and reducing downtime
Inventory management	Determines optimal safety stock levels and ordering time	Reducing storage volumes and freeing up working capital
Supply planning	Coordinates orders to suppliers in accordance with the production calendar	Reducing the number of urgent deliveries and logistics costs



Feedback and analytics	Automatically adjusts plans in case of changes in demand or supply	Increasing adaptability and flexibility of the supply chain
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Source: formed by the author based on [2, p. 439–441; 4; 7, p. 33–34; 8, p. 1241–1243; 9; 11, p. 457–459]

MRP has a tangible effect through a combination of inventory policies, production calendaring, and replenishment algorithms. It is demonstrated by the example of a multinational FMCG company operating in Southeast Asia, where the implementation of an MRP strategy based on a digital twin of the supply chain using machine-based demand forecasting and safety stock optimization ensured a reduction in average inventory levels by 35% and total costs by 20%, and in some sites – up to 40% of inventory without loss of service [14]. Additionally, in a large-scale network of production and sales operations, the transition from best-in-class tools to a single planning loop with complete visibility of material flows made it possible to abandon weekly cycles in favor of daily (sometimes shift-based) ones, integrate the planning of raw materials, packaging materials, production, and distribution into a single value stream, and systematically reduce buffer stocks, avoiding surpluses and service losses [15]. In general, the practical significance of MRP in modern conditions is to close the demand-production-supply loop more efficiently, which reduces variability, lowers costs, and enhances the reliability of order fulfilment through data-driven material flow management.

The consequences of implementing the MRP system in FMCG companies are evident in reduced excess inventory, minimised losses, and accelerated resource turnover. Studies show that better coordination of procurement, production, and supply, provided by MRP, contributes to inventory optimisation, reduces blocked capital, and increases the efficiency of material resource use (table 3).



Table 3

Results of MRP impact on key indicators of inventories, losses and resource turnover

Indicator	Expected change after MRP implementation	Typical practical result
Excess inventories	Reduction in the proportion of inventories exceeding regulatory levels	Reduction in the volume of inventories that are not used or awaiting use
Storage losses and write-offs	Reduction in the number of materials that have become unusable or obsolete	Fewer write-offs due to exceeding deadlines or changing the assortment
Resource turnover	Increase in the frequency of inventory turnover per unit of time	Higher frequency of batch replacement, lower average storage time
Capital locked in inventories	Reduction in the amount of capital invested in inventories	Freeing up funds for other investment or operational purposes

Source: formed by the author based on [2, p. 442–443; 6, p. 4243–4244; 9; 11, p. 463–465; 12, p. 45–46; 13, c. 113–114]

Practice confirms that the most significant effect is achieved when combining MRP with rhythmic recalculations of needs and prioritisation of replenishment based on actual consumption. The example of Ukrainian industrial food manufacturers illustrates this point. In particular, Bel Shostka Ukraine, has digitalised milk procurement on an industrial platform, where supply plans are formed automatically by analogy with previous periods, taking into account the quality of raw materials and logistical constraints [16]. This approach eliminates subjective deviations in procurement schedules, stabilises production workload and reduces the risk of exceeding shelf life in buffer zones of the warehouse.

Another example is the Ukrainian animal feed manufacturer Kormotech, where the implemented replenishment methodology based on MRP (Demand-Driven) logic ensured, according to published results, a 45% reduction in finished product inventories while simultaneously increasing sales by 40%, increasing service levels to 99%, and reducing overloaded items by 50% [17]. In terms of turnover management, this means more frequent and smaller replenishment cycles, a reduction in the average inventory days, and lower supply chain variability. Taken



together, these results reflect the mechanics of MRP in modern conditions: synchronisation of demand, production windows, and supplier lead times minimises unproductive time for product items in the warehouse, reduces losses from spoilage/obsolescence, and increases capital turnover without degrading the service level.

The implementation of MRP solutions in the practices of Ukrainian FMCG companies is accompanied by several systemic obstacles of a technological, organisational, economic, and personnel nature. One of the primary issues is the limited digital integration of internal business processes. In most enterprises, the modules for procurement, warehouse, production, and sales operate in a fragmented manner, which makes it impossible to form a single information space for calculating material needs [6, p. 4238–4239]. The lack of unified material directories, nomenclature codes and basic planning parameters leads to data inconsistencies and incorrect forecasts. The second significant challenge is the limited quality of the source information. Due to the lack of analytical accounting systems or automated data collection, enterprises often rely on manual demand estimates, average historical values or expert assumptions. It reduces the accuracy of MRP algorithms, which are based on the reliability of input indicators. The problem is exacerbated by irregular updates of regulatory and reference information, which distorts planned calculations of material needs.

A significant obstacle remains the technological incompatibility of MRP modules with existing ERP systems. A significant part of Ukrainian FMCG companies operate on outdated software versions that do not support real-time integration. It limits the possibilities for data exchange between production, procurement, and logistics, and also reduces the flexibility in responding to changes in demand or supply disruptions.

The economic factor is manifested in the high costs of implementation, licensing and technical support of MRP solutions. For medium-sized companies, the financial burden in the first years of project payback is significant, especially during



periods of war, inflationary pressure, and exchange rate instability. An additional complication is the lack of tax incentives or government grants for digitalising supply chains, which is common in EU countries [13, p. 113].

No less important is the personnel issue. Many enterprises lack specialists in material resource planning who are capable of configuring and analysing MRP parameters. Employees in logistics and production departments often lack a sufficient level of digital literacy to work with analytical panels, which leads to errors in data entry and a loss of trust in the system.

A separate group of problems is made up of external factors. Disruptions in logistics chains due to Russian aggression, shortages of transportation and fuel, and instability in the supply of imported raw materials reduce the efficiency of MRP work, even with correct planning. Under such circumstances, the system is faced with the need to constantly recalculate schedules and find alternative supply routes, which increases the load on the IT infrastructure [9].

Further development and scaling of MRP approaches in FMCG companies should be oriented towards a combination of technological innovations, standardisation of management processes, and international adaptation of planning practices. In modern conditions, the primary direction is the transition from classic MRP systems to integrated solutions encompassing MRP II and Advanced Planning and Scheduling levels, which encompass the planning of material, financial, and labour resources within a single digital environment. It allows for ensuring end-to-end transparency of supply chains, increasing planning accuracy, and reducing production cycles. A key factor in achieving further efficiency is the implementation of cloud technologies and Big Data analytical platforms that process large amounts of data in real-time and generate demand forecasts based on artificial intelligence. Based on the conducted research, the use of integrated MRP solutions in combination with predictive analytics tools and IoT monitoring significantly increases inventory management efficiency, optimises costs, and improves resource utilisation. The practical significance lies in the system's ability to dynamically



adjust supply schedules, promptly responding to changes in demand or disruptions in logistics, which makes it a crucial tool for adaptive and crisis management.

Further adaptation of MRP approaches should be based on harmonisation with European standards of logistics and production planning, particularly the recommendations of the European Logistics Association and the certification models APICS CPIM (Certified in Planning and Inventory Management) [18]. A promising direction of development is the implementation of demand-driven MRP, which has proven effective in transnational corporations due to the ability to combine strategic forecasting with operational inventory management. The implementation of such approaches will contribute to increasing the efficiency of logistics and production management of Ukrainian FMCG companies, their integration into global supply chains and the formation of a sustainable resource management system capable of adapting to market and geopolitical instability.

Conclusions. The study confirmed that the implementation of MRP is one of the most effective tools for increasing the effectiveness of inventory management in FMCG companies. It has been proven that MRP provides synchronisation of procurement, production, and supply processes, reducing excess inventory, losses, and the resource turnover cycle, which directly increases the financial stability and competitiveness of enterprises. The system establishes a foundation for transitioning from reactive to predictive and analytical management, which is a key condition for enhancing business productivity in an environment of changing demand. It was found that the main problems of using MRP in Ukrainian FMCG companies are the fragmentation of digital infrastructure, the lack of standardised data directories, low-quality source information, limited compatibility with outdated ERP systems, a lack of qualified specialists, and a high initial cost of implementation. External factors, particularly disruptions in supply chains, military risks, and exchange rate fluctuations, further reduce the stability of planning, which necessitates the construction of flexible and adaptive management models. It is recommended to develop comprehensive digital inventory management ecosystems integrated with



analytical demand modules, create national data standards for MRP systems, and introduce certification of specialists according to the APICS CPIM model. To enhance international adaptability, it is advisable to align Ukrainian practices with the European recommendations of the European Logistics Association and enhance inter-corporate logistics data exchange platforms. Prospects for further research include developing methods for assessing the economic impact of digitalising material resource planning, creating adaptive MRP models for conditions of high uncertainty, and building strategic scenarios for the integration of Ukrainian FMCG companies into global supply chains. The implementation of these areas will ensure not only increased operational efficiency but also increased business sustainability in the context of war and post-war transformations.

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