Impact Factor:					
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	ISI (Dubai, UAE) = 1.582	РИНЦ (Russia) = 0.191	PIF (India) = 1.940
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	JIF = 1.500	SJIF (Morocco) = 7.184	OAJI (USA) = 0.350

SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

Theoretical & Applied Science

p-ISSN: 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

Year: 2026 **Issue:** 01 **Volume:** 153

Received: 25.11.2025
Accepted/Published: 30.01.2026 https://T-Science.org

Issue Article

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NEW FORMS OF INNOVATIVE MANAGEMENT IN THE WAREHOUSING SYSTEM TO IMPROVE THE LOGISTICS MECHANISM

Abstract: *In this article, the authors examined the structure of a public-private partnership mechanism for modernizing the economies of Russian regions using research on labor market development trends in the regions, including the sustainability of entrepreneurship in Russia. Specifically, they explored the characteristics, trends, patterns, and new forms of innovative management within the labor market system. The authors also examined current and controversial issues of economic restructuring, explored ways to improve its efficiency, and formulated key guidelines for long-term economic policy.*

Key words: *transformation, development model, economic restructuring, efficiency, economic policy, innovation management, small and medium-sized businesses.*

Language: *English*

Citation: Prokhorova, Yu.I., Blagorodov, A.A., Prokhorov, V.T., Korablina, S.Yu., & Volkova, G.Yu. (2026). New forms of innovative management in the warehousing system to improve the logistics mechanism. *ISJ Theoretical & Applied Science, 01 (153),* 119-124.

Soi: https://s-o-i.org/1.1/TAS-01-153-11 ***Doi***: https://dx.doi.org/10.15863/TAS.2026.01.153.11

Scopus ASCC: *2000.*

Introduction

UDC 338.54:317.37.

This study presents the results of research and practical work conducted at a business entity in the real sector of the economy to improve its logistics mechanism. It is based on an innovative management implementation strategy that has become a trigger for

increased economic performance in the medium and long term. Drawing on a systemic, comprehensive, situational, and process-based approach, the author conducted a multifactorial analysis, identifying the potential for debottlenecking the organization by introducing the latest technologies and equipment into warehousing that are fully consistent with the principle of a high-value-added product. Innovative management, equipment, and technology combined helped achieve synergistic effects that meet global competitiveness standards for both the organization itself and its products (services). The resulting model for improving the logistics complex possesses sufficient adaptability and can be applied to any other area of production.

Main part

This problem has long attracted the attention of theorists and practitioners whose work is directly related to issues of innovative renewal in the real economy. Among Russian scholars who have authored fundamental works in this area, the names of P.I. Soldatov and others are well known. However, the dynamics of economic development in recent years have presented numerous new threats and challenges, including those related to the improvement of innovative approaches to management, which require a symmetrical response and resolution. To study this layer of scientific and practical activity, tools of statistical and mathematical analysis, deduction and induction, as well as systemic, integrated, process, and situational approaches were widely used. In the current economic conditions in Russia, there is a shortage of investment in the real economy, which requires special attention to issues of planning, justification, effectiveness assessment, and payback periods in the development and implementation of innovative projects. The implementation of modern digital technologies in the organization of an enterprise's transportation and warehouse system will ensure the smooth operation of participants in the transportation and warehouse processes within a unified information network, the daily processing of a large number of documents, and the reduction of the time required to move and store raw materials and finished goods on the enterprise's premises. Furthermore, the essence of a transportation and warehouse system is to ensure the delivery and storage of various types of cargo. The objectives of such systems include selecting the appropriate warehouse type and mode of transport, as well as minimizing the enterprise's costs for storing and transporting goods. It is logical to apply the 5S system to logistics processes. This new approach represents a set of organizational and technical measures for the rational organization of workplaces, ensuring occupational safety, increasing labor productivity, product quality, and enhancing production standards. The system's name is derived from the first letters of five Russian words, namely:

- order;
- maintain order;
- keep clean;
- standardize;
- improve.

Today, competition in industrial product markets in the Russian economy is growing, forcing companies to adapt and clearly define their prospects and development directions, taking into account the emergence of various business risks. Companies must continuously analyze business risks and make management decisions based on these risks. When developing strategic goals and making management decisions, every company often faces uncertainty, which stems from the constant change of the internal and external production environment. Risk management at most companies is carried out precisely to reduce this uncertainty and create a rational basis for making informed management decisions. The emergence of new financial and economic entities in the region with more attractive working conditions or higher wages for employees can adversely affect the human resources of these commercial organizations. For commercial organizations whose production cycle is linked to the import of raw materials or the export of their own goods, factors determined by changes in the national currency exchange rate are of particular importance. Risk factors such as environmental ones are becoming increasingly significant in the operations of commercial organizations. These factors are determined by the impact of production activities on the environment. In this regard, the enactment of a regional regulatory act aimed at tightening environmental requirements for production activities may be important, specifically:

- introduction of fines;
- stricter sanitary standards;
- changes in the environmental situation in the region due to natural disasters and man-made catastrophes;
- restriction or prohibition of the use of the region's natural resources that are needed for this production, etc.

Any production activity is directly linked to scientific and technological progress. It is noteworthy that the impact of innovative solutions can pose a threat to the economic security of a commercial organization. The analysis reveals revenue trends. Benteler Automotive's profit in 2024 was declining. The profitability indicator in 2024 is also quite low, declining from 61.7% to 34.3% compared to 2023. However, due to contracts concluded with several foreign companies in late 2024 and early 2025, revenue increased by RUB 22,913,797 compared to 2024. The company's products are highly valued among international consumers. Each year, Benteler Automotive expands production by introducing new

products, necessitating the optimization of its warehouse and transportation systems. Production volumes are growing, which is revealing the shortcomings of the current transportation and warehousing system. These shortcomings are related to the increased time it takes to move and store raw materials and finished products on the company's premises. These problems stem from the lack of modern automated handling and warehousing systems. Such shortcomings could lead to serious problems in the future, significantly impacting the company's image as a participant in foreign economic activity. Since Benteler Automotive's production and warehousing facilities are located in a rectangular reinforced concrete hangar with an area of 3,029 m2, the company, with sufficient space, can choose any modern warehousing system to improve its warehousing system and the company's overall logistics. Currently, warehousing at Benteler Automotive is implemented in two ways:

- rack storage, where small-sized production parts, raw materials, blanks, etc. are stored;
- Stack storage, where finished products are stored in the form of stacks and raw materials.

To improve Benteler Automotive's warehouse system, it's logical to choose Russian projects, as the current global political climate makes foreign projects difficult to access and unviable in terms of ROI. For improving Benteler Automotive's warehouse system, the most promising developments include robotic rail stacker cranes (NPK Tekhno Pribor JSC) and RoboCV X-MOTION NG. NPK Tekhno Pribor JSC manufactures automated warehouse equipment, develops process designs, and delivers comprehensive turnkey solutions for warehouses, logistics complexes, and industrial facilities. Importantly, the RoboCV X-MOTION NG can be easily integrated with a robotic rail stacker crane, allowing, with certain modifications, for automated handling and storage within the Benteler Automotive warehouse with minimal human intervention. Transport and warehouse systems are classified by the following criteria: by industry sector; by type of transported cargo; by physical condition; by type of transportation; by type of transport used; by warehouse design type. The company's business relationships include suppliers and consumers from both domestic and foreign countries. Benteler Automotive's sales revenue decreased over the analyzed period, amounting to RUB 63,045,399 in 2024, RUB 19,433,625 less than in 2023. This revenue trend is due to losses in sales volumes, which also decreased by 55.3%. Benteler Automotive's negative sales dynamics are primarily due to the economic crisis, which resulted in a significantly higher exchange rate at the end of 2024 and increased inflation. This, in turn, increased the prices of purchased materials from foreign suppliers, thereby increasing the cost of manufactured products by 23% and, consequently, final prices for consumers. Benteler Automotive's profit is trending downward in 2024. However, due to contracts signed with several foreign companies in late 2024 and early 2025, revenue increased by RUB 22,913,797 compared to 2025. All of the identified deficiencies could lead to serious problems in the future, which will significantly impact the company's image as a participant in foreign economic activity. A well-designed logistics system can ensure the safety of material assets and should always be aimed at eliminating material loss, shortages, and mis-delivery. The quality of personnel performance (including in the warehouse) determines production costs, profits, margins, labor productivity, and the fulfillment of contractual obligations for product delivery. This, in turn, affects the competitiveness of both manufactured products and the entire enterprise. The relevance of this topic is due to the fact that Effective logistics contribute to the successful and stable operation of an organization. All operations within this framework are highly significant for the organization. One of the most important areas, it seems, is properly organized warehouse operations. Key indicators such as product quality and the safety and completeness of inventory depend on the warehouse setup, the specialized facilities, and the equipment allocated for receiving, placing, and storing materials. Furthermore, warehousing plays a significant role in the enterprise, ensuring the dampening of economic fluctuations at the system's inputs and outputs. Therefore, it is necessary to develop a new operational algorithm for the effective management of existing warehouse assets.

This study is based on the analysis (and improvement) of the activities of the Kaluga branch of Benteler Automotive (hereinafter referred to as Benteler Automotive). This is a German industrial company founded in 1876. The Benteler Automotive plant in Kaluga is the first in Russia and the 69th enterprise of the company in the world. The enterprise Benteler Automotive in Kaluga was registered on September 28, 2007. The head of the organization is General Director Mayer Hartmut. Benteler Automotive is one of the leading suppliers to the global automotive industry and produces suspension modules, passive safety components, exhaust systems, and also offers comprehensive engineering solutions. It is a supplier to such large automobile companies as Ford, Volkswagen Group RUS, Renault, and Avto VAZ. Ford supplies welded and painted rear beams to the plant for subsequent vehicle assembly. Volkswagen Group RUS supplies wholesale automotive parts, components, and accessories. Renault and Avto VAZ supply painted and sealed parts for subsequent spare parts sales to auto parts stores nationwide. Currently, the plant specializes in the production of metal parts for the largest automotive manufacturers using modern technologies

such as cold stamping, automated assembly, MAG welding, painting, and 3D measurement. Its core business is the production of electrical and electronic equipment for motor vehicles. The company manufactures a wide range of products. Its core activities include:

- production of cars, trailers and semi-trailers;
- production of parts and accessories for automobiles and their engines;
- production of parts and accessories for automobiles and their engines;
- scientific research and development in the field of natural and technical sciences;
- wholesale trade in automotive parts, components and accessories.

The goal is to develop the most advanced algorithm for improving the organization of warehouse operations at the enterprise. One of the key requirements is the high adaptability of the new logistics model, allowing for its subsequent adaptation and implementation across various territories and sectors. The core component is the empirical component, as the primary vector for economic development.

The study utilized numerous methodological, scientific (including periodicals), and educational literature, statistical data, online materials, as well as primary and consolidated documents from a specific enterprise in the real economy—Benteler Automotive LLC. The methodological basis for the study included systems, integrated, process, and situational approaches, as well as the results of multivariate, mathematical, and statistical analysis. An analysis of forklift operation in the warehouse revealed an issue with driver overtime during the first shift. The net working time of one forklift during the first shift is 7 hours and 5 minutes, which, given current standards, is a deviation from the work norm. Forklifts are heavily overloaded, resulting in them either increasing the permitted speed within the warehouse during peak hours or providing uneven material delivery to the line. The causes of this problem are outlined below:

1. In the first half of the day, the majority of the acceptance of incoming materials takes place;
2. Inefficient arrangement of materials in the warehouse.

It is practically impossible to change the arrival time of new materials at the enterprise, since this time is determined not only by the receiving enterprise, but also by the supplier enterprise. To address the inefficient positioning of materials in the warehouse, the following solutions are proposed: reordering materials. The warehouse contains materials located remotely from consumption lines, and relocating them would significantly reduce delivery time for these materials. The warehouse also contains a group of materials located remotely from the point of consumption. This factor negatively impacts the performance of forklift drivers, and therefore the operation of the entire warehouse.

In total, it takes one forklift about an hour to deliver these materials per shift. To optimize warehouse workers' time, it's necessary to reduce the time spent delivering these materials. To achieve this, a new material placement option can be proposed. Let's take a closer look at the new material placement option:

Material #1, "Shock Absorber Strut," is moved from rack S2 to rack S4. This move is possible because rack S4 has unsold empty space on tiers 4 and 5.

Material #2, "Coil Spring," will be moved from location A to location G. This move is possible by swapping the materials in locations G and A. This change will have a positive impact on delivery time, since the material currently in location G is less in demand per shift than the "Coil Spring" material.

Material #3 can be moved from rack S1 to rack S5. This move is possible because there is empty space on the third tier of rack S5.

No. 4 is proposed to be moved from rack S2 to location G. This location allows for the material to be placed without affecting access to the line.

It is proposed to move material #5 from location H to location E, swapping the materials. This change is possible because the material in location E has a lower consumption than material #5.

This means that a slight increase in distance will not affect the overall performance of the forklift. As a result of these measures, material delivery times have been reduced, resulting in more consistent driver workloads. The company's second challenge is the lengthy delivery process. A consignment truck services the supermarkets on the line. (It's important to clarify that a supermarket at the company refers to a small mobile shelving unit located directly next to the production line, where the consignment truck delivers small and frequently used materials from the warehouse.) Resolving this issue will significantly speed up the delivery of materials to the consumer line.

To optimize loading and unloading operations at Benteler Automotive LLC, it is proposed to introduce a new pickup truck for delivering small, but frequently used materials to the consumer line, as well as to install a barcode scanner at supermarkets. These measures will speed up the delivery of materials to the consumer line. The introduction of an unmanned pickup truck and scanner will optimize operating hours by reducing the most time-consuming tasks for the pickup driver and will also eliminate errors during delivery of materials to supermarkets. It takes approximately 18 minutes for a pickup driver to drive around supermarkets collecting kanban cards. To speed up this process, it is proposed to install a computer with a barcode scanner near each supermarket.

Let's take a closer look at the algorithm for this

operation before and after implementation. After the scanner is implemented at supermarkets, the commission driver will no longer need to visit, as the line operator will scan the barcode on the kanban card using a barcode scanner when locating the last box of material in the supermarket. After scanning the barcode, the data for the required material will be displayed on a monitor located near racks S1 and S2.In the current process, after collecting the kanban cards, the forklift transports them to a computer located near racks S1 and S2 and scans the card's barcode. The computer displays information about the material: the number and name of the material, and its location on racks S1 and S2. A list of materials to be delivered to the line is then generated. However, this list is generated in the same order in which the kanban cards are scanned. Therefore, when searching for materials on the rack, the commission driver relies solely on their own knowledge of rack storage. This factor increases the likelihood of error, meaning the driver will spend additional time turning around and searching for the material. When selecting a suitable commission driver, two companies with established reputations in the global market were considered: Jungheinrich and Linde Material Handling. The Jungheinrich manufacturer offers an EZS 350a electric tow truck. Linde Material Handling offers a P20 electric tow truck. Based on the analysis conducted, as well as the specifics and focus of the company, the Jungheinrich EZS 350a electric tow truck is the best option (after preliminary calculations). This electric tow truck is capable of automatically moving trailers weighing up to 5 tons, increasing the efficiency and speed of standard warehouse operations, while human resources can be focused on more important tasks. To successfully implement these proposals, it is necessary to develop a sound plan for the implementation of the selected innovation. The first stage requires an implementation plan with an adjusted timeline. The implementation of the unmanned electric tow truck consists of eight main stages, namely:

1. Purchase and transportation of new equipment required by the company. Specifically, an unmanned electric freight towing truck.
2. Warehouse preparation and equipment. This stage includes approval of the new equipment's placement in the warehouse, completion of basic preparation activities, as well as installation, setup, and commissioning of the new equipment.
3. Technology. At this stage, it is necessary to resolve any issues that arise during equipment startup, as well as troubleshoot software errors.
4. Worker training. Before starting work on new equipment, warehouse workers must be instructed on safety precautions for operating the new equipment. Work instructions are also prepared.
5. APQP (Advanced Product Quality Planning) – advanced product quality planning.
6. Maintenance. It's essential to plan your electric tractor's maintenance in advance.
7. A test run of the unmanned picker. Analysis of warehouse movement and correction of any issues.
8. Starting the equipment to operate in normal mode.

Based on the results of this study, implementation of the technological innovation at the warehouses of Benteler Automotive LLC is scheduled to begin in late 2025. The payback period for this innovative solution can be calculated broadly as the reciprocal of the profitability indicator, or more precisely, given that the return on the initial investment is achieved not only through net profit but also through accumulated depreciation. In this case, the calculation is made by gradually, step-by-step, subtracting the depreciation charges and net profit for the next planning interval from the total capital expenditures. We will also calculate one-time capital expenditures. These include the costs of purchasing and implementing equipment. Currently, the company has a Wi-Fi access point and the required number of computers. Therefore, it can be concluded that the company needs to purchase the missing equipment. It is possible to finance capital expenditures using the company's own funds. In our case, one-time capital expenditures include the cost of purchasing a barcode scanner, Wi-Fi routers, and an unmanned electric tow truck (including transportation and installation). If the company uses existing equipment, its cost is included in capital expenditures at book value. In the base case, capital expenditures can be assumed to be zero. This is possible because the commission agent currently working at the company will be transferred to another warehouse. The company does not have a Wi-Fi router or barcode scanner. In addition to the costs of system implementation and equipment purchase, ongoing technical support for the system is required. Unlike the costs listed above, these costs are ongoing. They must be incurred once every three months, beginning with the first month of equipment operation. This technical support includes the following algorithm:

1. Technical consultations with a specialist by phone;
2. Remote connection to the system;
3. Departureadjuster, identifying the malfunction and the reasons for its occurrence;
4. Correcting user errors
5. Diagnostics of electric tractor operation;
6. Update of the Jungheinrich Logistics Interface app.

Conclusion

Continuous use of technical support will ensure the continuous operation of the equipment, as well as timely system updates.

Let's conduct a comparative analysis of the costs for the baseline and projected electric tractor operation scenarios (calculated per hour of operation). Thus, the

total cost required by Benteler Automotive LLC to implement this process innovation is 438,395 rubles. The company's annual savings will amount to 236,490.5 rubles. The overall payback period for the project is 1.7 years. And the project's profitability will be 0.54%, which is quite impressive.

The implementation of the proposed measures will also significantly improve the psychological climate within the logistics team. Forklift drivers will be able to perform their work calmly and without rushing. They will experience less psychological fatigue, which means fewer sick days. This, in turn, will lead to a reduction in non-productive time, and consequently, increased productivity and revenue. It is logical to assume that the proposed measures will have a positive impact on the company's operations, resulting in savings of 119.5 rubles. The payback period will be 1.7 years, and the annual savings will amount to 236,490.5 rubles. In an era of international integration and globalization, on the one hand, and harsh sanctions against Russia for unfair competition from Western countries, a system of internal logistics functions seems like a panacea that could become one of the triggers for further innovative growth based on this function's contribution to the added value of virtually all manufactured goods. Based on the results of the study, it can be confidently concluded that improving logistics structures, including warehouse operations, currently represents one of the greatest reserves for economic development. Innovative management, implemented within this development vector, allows for a multiplier effect on revenue growth across many other areas.

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