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с доклади от кръгла маса

ИНДУСТРИАЛНИЯТ БИЗНЕС И ПРЕДПРИЕМАЧЕСТВОТО В УСЛОВИЯТА НА ГЛОБАЛНИ ТРАНСФОРМАЦИИ

16 октомври 2026 г.



СТОПАНСКА АКАДЕМИЯ „Д. А. ЦЕНОВ“ – СВИЩОВ

Сборник с доклади от кръгла маса:

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Милена Христова

IMPROVEMENTS IN ENTERPRISE OPERATIONS MANAGEMENT RESULTING FROM THE APPLICATION OF ARTIFICIAL INTELLIGENCE

Head assistant prof. Stefan Kalpachev[1], Ph.D.

Abstract: *The report examines the potential for using AI in corporate operations management through the lens of the resource-based view, focusing on decision-making areas such as demand forecasting, inventory management, and risk management. The analyses presented in the report systematically identify where and how AI can be applied within operations management, highlighting areas where it can enhance efficiency, accuracy, and sustainability.*

Key words: *Operations management, resource based view, AI*

JEL: M11, D24

ПОДОБРЕНИЯ В ОПЕРАЦИОНИЯТ МЕНИДЖМЪНТ НА ПРЕДПРИЯТИЕТО, ПРОИЗТИЧАЩИ ОТ ПРИЛАГАНЕТО НА ИЗКУСТВЕН ИНТЕЛЕКТ

Гл. ас. д-р Стефан Калпачев

Резюме: *Докладът разглежда потенциала на използването на AI в операционния мениджмънт във фирмите от гледна точка на ресурсната теория в области за вземане на решения като прогнозиране на търсенето, управление на запасите, управление на риска и др. Анализите извършени в доклада систематично идентифицират къде и как AI може да бъде приложен в операционния мениджмънт, като се предлагат области, в които AI може да осигури подобрена ефективност, точност и устойчивост.*

Ключови думи: *Операционен мениджмънт, ресурсно базирана теория, изкуствен интелект.*

JEL: M11, D24

1. Introduction

Operations management is concerned with designing, planning and controlling the processes that turn resources into goods and services. Decisions in this field – how much to produce, what inventory to hold, how to use capacity and how to respond to a supply disruption – have traditionally been made with

[1] stefan.kalpachev@ue-varna.bg, University of economics - Varna

statistical and optimisation models. Today these models operate in an environment of greater uncertainty: the COVID-19 pandemic, natural disasters and geopolitical tension have made operational resilience a strategic priority (Fosso Wamba et al., 2024).

In this environment, artificial intelligence (AI) is establishing itself as one of the most significant technologies for operations. Generative AI (GAI) and large language models have given it new momentum, building on growing computing power, new architectures and pre-training on enormous datasets (Jackson et al., 2024). Practical examples already exist: according to Jackson et al. (2024), Walmart uses GAI to negotiate prices with suppliers automatically, while Maersk and DHL are exploring its adoption in their operations. At the same time, the discipline's theoretical readiness to explain this change lags behind (Jackson et al., 2024).

The aim of this report is to systematise how AI is used in operations management, which of its capabilities underlie the applications, and what the managerial implications of adoption are. The specific studies mentioned below are presented as described in these two articles. The order of exposition is: AI capabilities, areas of application, resilience and risk management, managerial implications and limitations.

2. AI Capabilities Through the Lens of the Resource-Based View

Definitions of AI are numerous and often overlap. After analysis of 18 definitions– from the early formulations of McCarthy and Samuel to those of the OECD, the European Commission, McKinsey and Google – Jackson et al. (2024) derive six core capabilities: learning, perception, prediction, interact-tion, adaptation and reasoning. Learning includes supervised, unsupervised, semi-supervised and transfer learning; perception – computer vision, audio processing and natural language processing; prediction – regression, classificat-tion, time-series analysis and anomaly detection; interaction – reinforcement learning and human–AI interaction; adaptation – continuous learning and evolutionary algorithms; reasoning – symbolic reasoning, planning and decision making. These capabilities rarely act in isolation and are usually combined within a single application.

The theoretical basis is the resource-based view, according to which sustainable competitive advantage derives from resources that are valuable, rare, inimitable and non-substitutable (Barney, 1991). AI capabilities can be regarded precisely as such resources, embedded in the organisation. According to Jackson et al. (2024), the role of AI is twofold. On the one hand, it can substitute for human cognitive capabilities and, owing to low reproduction costs and small barriers to imitation, erode traditional advantages. On the other, it can complement them and thus create new advantages through a combination of human expertise and AI capabilities. Owning the technology is not enough, however: the concept of dynamic capabilities (Teece, Pisano, & Shuen, 1997)

emphasises a firm's ability to adapt, integrate and reconfigure internal and external resources in line with changing market conditions.

Generative AI (GAI)– extends these capabilities. It enables the creation of synthetic data when real data are scarce or sensitive, and the generation of planning scenarios and program code. Jackson et al. (2024) introduce also a seventh capability – artificial „creativity", i.e. the ability to generate new and potentially useful solutions by recombining learned elements.

3. Main Areas of Application

Jackson et al.(2024) structure their analysis around 13 areas of operations and supply chains adopted from Ivanov et al. (2021): demand forecasting, distt-ritbution and transportation strategy, inventory management and warehousing, process design, production planning and control, production strategy, quality management, revenue management, sales and operations planning, scheduling and routing, sourcing strategy, supply chain design and supply chain risk manat-gement. Table 1 summarizes selected examples, which are discussed below.

Table 1. Selected AI applications in operations management

Area	**Leading capabilities**	**Example**
Demand forecasting	learning, prediction, adaptation	An LSTM network whose hyperparameters are tuned by a genetic algorithm forecasts volatile demand better than other supervised methods (Kantasa-Ard et al., 2021)
Production planning and control	learning, perception, prediction, adaptation	CNN and LSTM models with transfer learning predict order progress in make-to-order production (Liu et al., 2022)
Inventory management	learning, prediction, interaction	Deep reinforcement learning in the „beer game" (Oroojlooyjadid et al., 2022)
Quality management	perception, prediction	Computer vision and prediction in Industry 4.0 manufacturing (Shahin et al., 2023)
Distribution and transportation	learning, interaction, adaptation	Reinforcement learning for the shortest-path interdiction problem under a limited budget (Huang et al., 2023)
Risk management	learning, prediction, reasoning	Graph neural networks for hidden supply chain risks (Kosasih et al., 2022)

3.1. Forecasting and Planning

Forecasting is one of the most developed applications because demand drives inventory, production and distribution decisions. AI can be particularly useful in increasing accuracy by learning from large volumes of historical data and adapting models as demand changes. Chien et al. (2020), for instance, use deep reinforcement learning to select the most suitable forecasting model for each product in semiconductor distribution. Supply-side data are forecast as well: machine learning models help planners estimate capacity consumption and prepare feasible production plans (Tremblet, Thevenin, & Dolgui, 2023).

Generative models add a further capability: they create plausible future scenarios for demand, inventory requirements, available capacity and supplier performance, which supports planning for unexpected events and strengthens supply chain resilience (Jackson et al., 2024).

3.2. Inventory, Production and Quality

Jauhar et al. (2023) show that no-code AI platforms allow specialists without programming skills to build effective models for predicting inventory distortions, while experienced programmers save considerable time. In the beer industry, deep reinforcement learning produces near-optimal orders when partners follow a base-stock policy and outperforms it when they behave unpredictably, like humans (Oroojlooyjadid et al., 2022). In manufacturing, Chen et al. (2021) predict strip breakage in the cold rolling of electrical steel using recurrent neural networks trained on real data, and Kusiak (2020) considers convolutional networks and GANs in predictive models in the spirit of the digital twin. An example of GAI is the use of GPT-3 Codex, which generates code for simulating queues and inventory control from a verbal description. It thus combines interaction and creativity and frees experts for strategic tasks (Jackson et al., 2024).

3.3. Transportation and Services

In transportation, reinforcement learning is used for decision making in a dynamic environment, for example in shortest-path optimisation (Huang et al., 2023). In services, Mariani and Borghi (2023) analyse online hotel reviews and find that AI-supported operations increase overall customer satisfaction.

4. Resilience and Risk Management

Disruptions such as pandemics and natural disasters can simultaneously raise demand and cause stockouts (Fosso Wamba et al., 2024); operations must therefore be not only efficient but also flexible and adaptive. The special issue presented by Fosso Wamba et al. (2024) includes 12 papers on AI, production systems and operations management resilience. The main results are as follows:

- Dohale et al. (2022) identify 17 critical success factors for AI adoption; the most influential for production resilience during disruptions are responsiveness, prediction, recovery, robustness and flexibility.
- Lerch et al. (2022) find, for German manufacturing during COVID-19, that firms with different AI readiness were affected differently by the constraints, and that manufacturers must overcome certain readiness thresholds to increase their resilience.
- Dey et al. (2023) show, for small and medium-sized enterprises in Vietnam, that AI adoption improves supply chain agility, risk management and circular economy practices.

• Wong et al. (2022) show that AI-driven risk management positively influences supply chain agility, with supply chain re-engineering having both a direct and a mediating effect.

• Kosasih et al. (2022) combine graph neural networks and knowledge graph reasoning to detect hidden risks in the automotive and energy sectors.

These results indicate that AI supports resilience through earlier detection of problems and better resource planning. AI, however, rarely acts alone. Jackson et al. (2024) point to synergies with the Internet of Things, 5G networks, blockchain, cloud computing and the metaverse, as well as with the „intelligent digital twin“ – a human–AI system that digitally replicates the physical supply chain and enables more proactive management of disruptions (Ivanov, 2023).

5. Managerial Implications, Adoption Factors and Limitations

Generally five managerial implications may be derived when using the framework used by Jackson et al.(2024):

1. Identification where AI can be applied, as managers assess their processes against the individual capabilities.

2. Prediction and reasoning support data-driven decision making (Choi, Wallace, & Wang, 2018), while GAI adds new decision options.

3. AI optimizes processes such as demand forecasting and production planning.

4. Understanding the capabilities makes it possible to prioritise investments where they best match operational needs.

5. Skills must be developed: organisations need to train staff to work with AI tools.

The effect on productivity looks promising but not yet fully clarified. For call-centre operators, GAI raises productivity by 14%, and for the least experienced employees by more than 30% (Brynjolfsson, Li, & Raymond, 2023), yet the ultimate effect on productivity and growth remains uncertain, as there are publications referring to call-centers dealing with complaints that lost business when they adopted AI chatbots with the intention to serve customers requiring human contact.

Successful adoption depends on a number of factors. Merhi and Harfouche (2023) map 12 enablers using the technology–organisation–environment framework: technological enablers prove more critical than organisational and environmental ones, and project management stands out as a key enabler. Lerch et al. (2022) add that a certain degree of readiness is needed. According to Fosso Wamba et al. (2023), the perceived benefits of GAI intensify after adoption while the challenges diminish.

6. Conclusion

The analysis shows that AI is not a single technology but a set of capabilities – learning, perception, prediction, interaction, adaptation and reasoning – complemented by the creativity of generative AI. It is the combination of these capabilities that explains its wide application across 13 areas of operations management, from demand forecasting and inventory management to quality, transportation and risk (Jackson et al., 2024). Through the lens of the resource-based view they are strategic resources, but advantage comes only from a firm's ability to integrate them into its processes and reconfigure them as the environment changes.

Studies show that AI supports the resilience and agility of operations, especially in risk management (Fosso Wamba et al., 2024). For practice this means assessing processes against AI capabilities, prioritising investments, building organisational readiness and developing staff skills. At the same time, the effects depend on organisational readiness and on the quality of human oversight of AI outputs. Future research should examine the effect of AI on resilience under more severe disruptions, the role of humans in interaction with AI, and the risks of bias.

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