The American Journal of Management and Economics Innovations
ISSN 2693-0811 | Open Access

TYPE Original Research
PAGE NO. 22-29
DOI 10.37547/tajmei/Volume07Issue06-04

The Economic Impact of AI Adoption: Measuring Productivity and Competitive Advantage in International Enterprises

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OPEN ACCESS
SUBMITED 24 April 2025
ACCEPTED 22May 2025
PUBLISHED 10 June 2025
VOLUME Vol.07 Issue 06 2025

CITATION
Farrukh Avezov. (2025). The Economic Impact of AI Adoption: Measuring Productivity and Competitive Advantage in International Enterprises. The American Journal of Management and Economics Innovations, 7(06), 22–29. https://doi.org/10.37547/tajmei/Volume07Issue06-04.

Abstract: This article covers the economic impact analysis by quantitative assessment through implementing artificial intelligence technologies. It analyzes how AI solutions are Productively applied and the formation of sustainable competitive advantage in multinational corporations. The relevance of this study is justified by the rapid growth that exists in corporate and venture investments in AI, a forecast of global AI spending to reach USD 632 billion by 2028, and a need for companies to adapt business processes as fast as possible to keep them competitive in the international market. The novelty of the work lies in a comprehensive synthesis of industry statistics (CB Insights, IDC, McKinsey, PwC, OECD), resource-based theory of the firm, and the concept of dynamic capabilities to explain sustainable advantages. The methodology includes descriptive and comparative analysis of financial metrics, macroeconomic forecasts of AI's added value, and detailed case studies of implementations at Google, Amazon, Nike, and Starbucks. The significant results show that, in general, artificial intelligence raises firms' labor productivity by 0–11%, improves Overall Equipment Effectiveness in manufacturing, quickens Time-to-Market, and increases Customer Lifetime Value in retail and services. Generative AI can add between 1.3% and 9.3% of revenue in different fields of business; also, the worldwide economic impact is approximated at USD 2.6–4.4 trillion per year. Sustainable competitive advantage emerges at the intersection of VRIN resources (unique data, algorithms, infrastructure) and firms' ability to sense, seize, and transform new opportunities rapidly. At the same time, the key constraints are regulatory costs, the capital intensity of infrastructure, and the hype cycle effect. This article will be helpful for managers, strategists, and analysts of multinational corporations, as well as consultants and researchers assessing the economic efficiency and competitive benefits of AI implementation.

Keywords: artificial intelligence; economic impact; labor productivity; competitive advantage; VRIN; dynamic capabilities; generative AI; macroeconomic contribution.

INTRODUCTION

In recent years, the global artificial intelligence market has transitioned from an experimental phase to one of large-scale investments by corporations, venture capital funds, and sovereign wealth funds. According to data [1], total corporate investments in AI rose from USD 92 billion in 2022 to USD 142.3 billion in 2023—an increase of almost 55% in a single calendar year, making this segment one of the fastest-growing technology markets.

Venture capital is following the same trajectory: in 2024, startups working with AI raised USD 100.4 billion [2], accounting for 37% of global venture financing and 17% of deals—the highest figures on record [3]. The average round size increased to USD 23.5 million, reflecting project maturity and investors' confidence in their commercial potential [4].

Corporate budgets for AI implementation and support are expanding just as rapidly. IDC forecasts global spending on AI technologies will reach USD 632 billion by 2028 [6]. Such long-term commitments indicate that companies no longer view AI as an auxiliary IT tool but are embedding it at the core of their operational and product models.

Under these conditions, international enterprises face economic and strategic pressure to rapidly transform their business processes through AI to maintain competitiveness in global markets. This combination of financial benefit and competitive necessity underscores the relevance of further analysis of AI's impact on productivity and sustainable corporate advantages.

MATERIALS AND METHODOLOGY

The study's materials and methodology rely on analyzing 29 sources, including industry reports, government publications, academic articles, and empirical case studies. Comprehensive data on corporate and venture investments were drawn from CB Insights reports [1–4], while forecasts of global AI spending were sourced from IDC studies [5, 6]. Economic mechanisms and models of competitive advantage are based on Barney's resource-based theory of the firm [11], as extended in the works of Ristyawan [12] and Simón [13] on organizational dynamic capabilities. Empirical cases and practical recommendations were taken from European Parliament reports [7], Samsung SDS cost-optimization studies [8], and IBM and FIU research on personalization and predictive analytics [9, 10].

Descriptive statistics and comparative analysis methods were employed to assess the economic impact quantitatively. Values for revenue, operating expenses, and capital expenditures were aggregated by year and sector based on publicly available data from CB Insights, IDC, McKinsey, and PwC [1–6], [15–16]. The evolution of AI's contribution to macroeconomic indicators was evaluated using forecasts from McKinsey [15], PwC [16], and the OECD [19]. Analysis of benefit distribution across industries was conducted using McKinsey diagrams illustrating generative AI's influence on business functions in various sectors [15].

Qualitative analysis of competitive advantages drew on the resource-based theory of the firm [11, 12] and the dynamic capabilities concept to interpret firms' ability to sense and transform new opportunities [13, 14]. Case study methods included detailed reviews of AI solution deployments at Google [22], Amazon [23], Nike [24], and Starbucks [25]. To assess manufacturing and logistics effects, metrics for Overall Equipment Effectiveness [20] and labor productivity were analyzed using data from Clear Object and Gartner [21].

Regulatory context and risk management were considered by comparing the EU AI Act (dataset audits, Art. 10) [28], NIST AI RMF recommendations [11], Canada's Algorithmic Impact Assessment [12], and Singapore's Model AI Governance Framework [14]. Identification and management of hype cycle risks were based on analysis of the Gartner Hype Cycle 2024 [29] and surveys by MIT and McKinsey on the maturity and scalability of AI initiatives [17, 18].

RESULTS AND DISCUSSION

The economic impact of artificial intelligence in the corporate environment is conventionally defined as the aggregate change in fundamental financial parameters—revenue growth, reduction of operating costs, and more efficient use of resources. The European Parliament report emphasizes that algorithms can significantly enhance decision-making, reduce expenditures, and optimize production factors across nearly all economic sectors, thereby increasing returns on capital and labor resources [7]. Corporate reviews by Samsung SDS illustrate this at the applied level: expenditures on deploying open models in the cloud are allocated among GPU time, RAM, and data storage, allowing precise calculation of the breakeven point and reducing total cost of ownership compared to purchasing commercial API licenses [8]. Figure 1 illustrates the stages of AI model development, showing cost growth for services and skills along the vertical axis—ranging from the least expensive stages at the bottom, through data operations, model fine-tuning and RLHF, to the most resource-intensive stage of creating and training proprietary models—while the horizontal axis contrasts a focus on structured data at left with documents and unstructured sources at right.

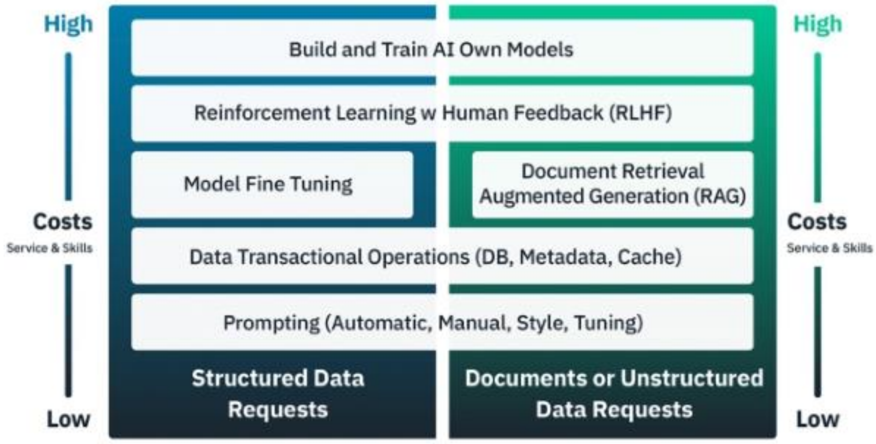

Fig. 1. AI Model Development Stages and Costs [8]

If the economic effect reflects the first derivative of technology adoption, then competitive advantage characterizes the durability of these outcomes over time. A study [9] shows that AI-based predictive analytics enables companies to forecast demand more precisely, thereby outpacing competitors in pricing and product decisions. IBM highlights another dimension of advantage—scalable personalization: algorithms generate real-time recommendations, increasing conversion rates and reducing customer acquisition costs [10].

From the standpoint of the resource-based theory of the firm, unique data, algorithms, and computing infrastructure satisfy the VRIN criteria—value, rarity, inimitability, and non-substitutability—and therefore can serve as sources of long-term advantage. In his seminal work, Barney [11] establishes a direct relationship between control over such resources and above-normal profits, a link confirmed by later empirical reviews demonstrating how AI assets become strategic barriers to industry entry [12].

However, valuable technology alone does not guarantee success; the decisive factor is the firm's dynamic capabilities to sense, seize, and transform opportunities under conditions of uncertainty. Study [13] defines dynamic capabilities as the ability to integrate, build, and reconfigure resources amid rapid environmental change, emphasizing that AI accelerates the feedback loop between market signals and organizational response.

By connecting these two theoretical frameworks, one can conclude that competitive advantage emerges at the intersection of the VRIN characteristics of AI resources and the firm's ability to reconfigure them for new market opportunities continually. The absence of either component diminishes the economic effect, as evidenced by a survey [14]—74% of organizations report scaling difficulties even after pilot success. Companies that establish organizational mechanisms for developing, updating, and disseminating AI competencies record lower unit costs and higher revenue growth rates from new products, as confirmed by recent industry meta-studies on AI-initiative profitability.

Macroeconomic estimates by leading consultancies converge on the view that AI's economic contribution already rivals the GDP of major economies: McKinsey calculates that generative models can add USD 2.6–4.4 trillion annually to the global economy—boosting the aggregate impact of all AI types by 15–40% and equating to the combined GDP of the United Kingdom [15]. As shown in Figure 2, generative AI can contribute 1.3–9.3% of revenue depending on the industry: the most tremendous impact occurs in high-tech sectors (4.8–9.3% or USD 240–460 billion), followed by banking (2.8–4.7% or USD 200–340 billion) and healthcare (1.8–3.2% or USD 150–260 billion). The most significant effects appear in marketing and sales (dark-blue cells across all rows), substantial gains in customer operations (especially in banking and insurance), product R&D (pharmaceuticals, electronics), and supply-chain management (manufacturing and telecommunications). Software development and risk management see moderate benefits, whereas strategy, finance, corporate IT, and HR show the most noticeable efficiency gains.

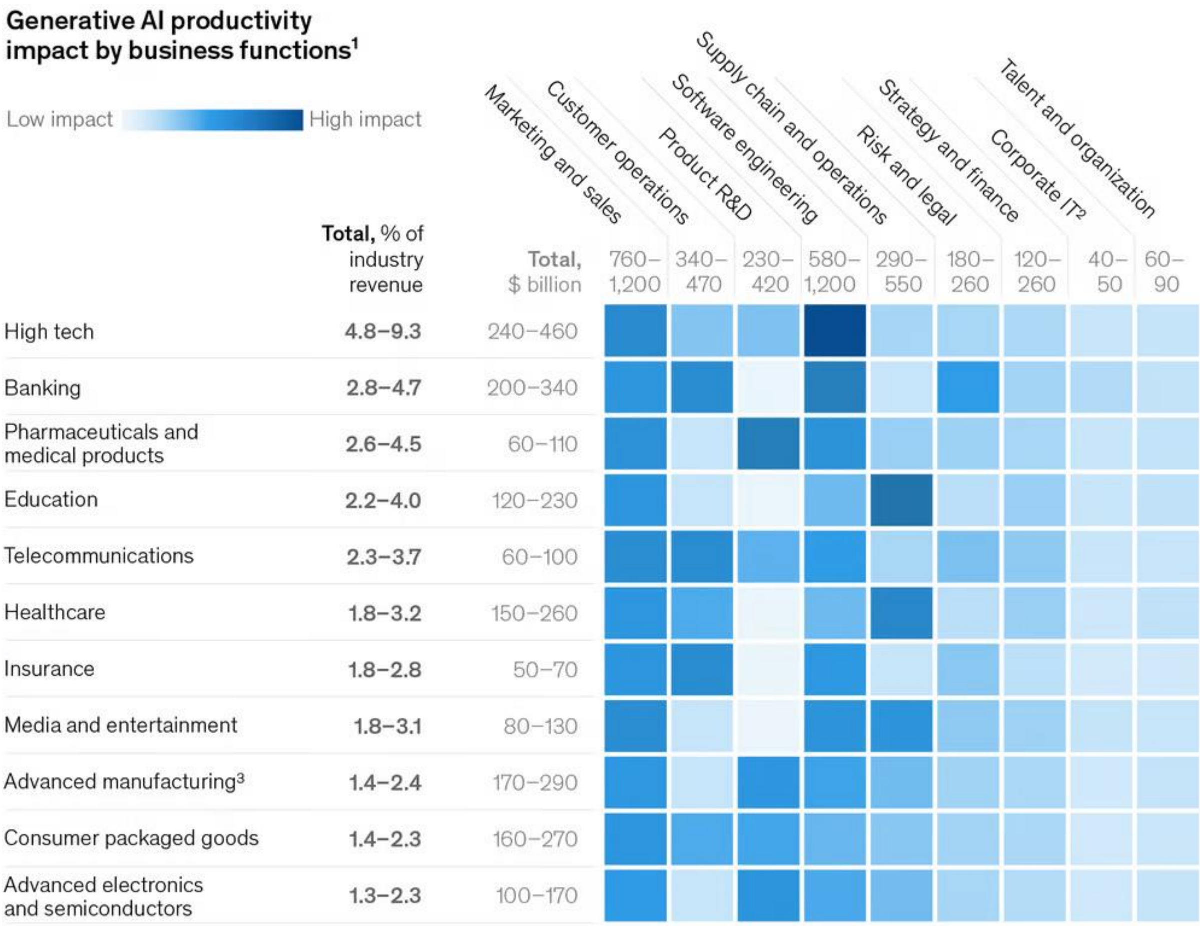

Fig. 2. Generative AI use cases will have different impacts on business functions across industries [15]

PwC, extrapolating productivity growth and consumer demand, forecasts a 14% increase in global GDP by 2030 (USD 15.7 trillion) [16].

Academic research adds further detail on benefit mechanisms. Report [17] finds that 80% of data and analytics leaders expect a business environment transformation driven by generative AI, identifying the ability to rapidly integrate models into existing decision-making processes as the key success factor. These findings align with McKinsey's State of AI survey, which reports that 78% of respondents use AI in at least one business function and 71% regularly apply generative tools, six percentage points higher than six months earlier [18]. Figure 3 shows that after a slight dip in 2022 (from 56% to 50% of companies using AI in one or more functions), a sharp rise began in 2023–2024: by the end of 2024, 78% of organizations employed AI in one or more functions; 63% in two or more; 45% in three or more; 28% in four or more; and 16% in five or more. The most striking growth is in multifunctional deployment—firms using AI in three areas nearly tripled, and in four regions, almost quadrupled—indicating a shift from isolated experiments to broad AI integration across all key business processes.

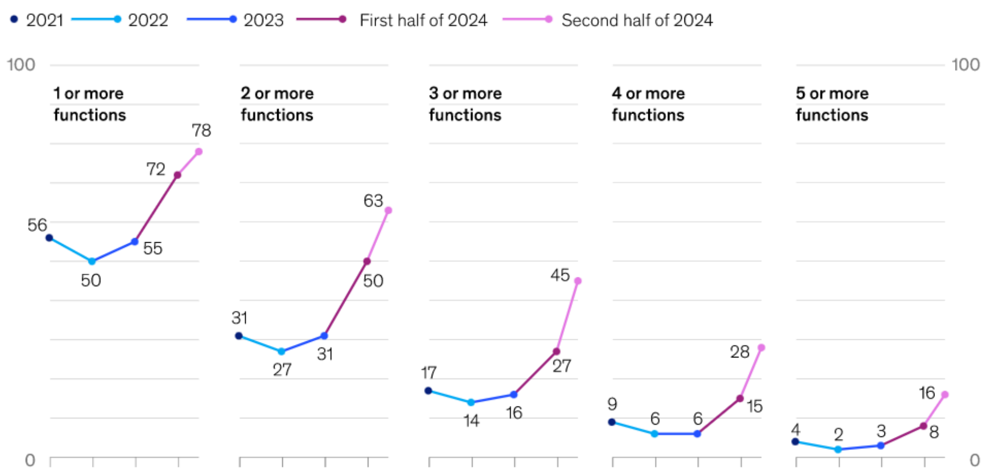

Fig. 3. Business functions at respondents' organizations that are using AI, % of respondents [18]

These qualitative data support the conclusion of consulting and academic works that measurable productivity gains and competitive superiority arise only where AI is embedded in an organization's strategic contours rather than existing as isolated experiments.

Labor productivity—measured as output per employee or hour worked—remains the primary indicator through which firms capture economic returns from AI: an OECD meta-analysis across nine advanced economies for 2016–2021 showed that mere presence of AI solutions in one primary business function correlates with a 0–11% productivity increase at the enterprise level [19]. For manufacturing sites, the analogous throughput metric is Overall Equipment Effectiveness: AI-driven computer-vision systems can automatically capture telemetry on Availability, Performance, and Quality, thereby raising OEE to the global benchmark of 85% without manual data entry [20]. In service industries, critical metrics are Time-to-Market and Customer Lifetime Value; Gartner emphasizes that generative AI accelerates product and campaign launches by eliminating content bottlenecks and making personalization a continuous feature, directly reducing TTM and increasing CLV [21].

Empirical cases illustrate how these metrics change in practice. Google deployed a DeepMind AI system for autonomous control of data centre cooling: the algorithm optimizes cold-air delivery in minute-by-minute intervals. It reduces cooling energy consumption by 40%, equating to double-digit operational cost savings and increased labor productivity since the same compute volume now requires less energy and fewer maintenance staff [22].

Amazon cemented this effect at the logistics level: by early 2025, over 750,000 robots were operating in its warehouses, and analysts estimate potential annual fulfillment cost savings of USD 10 billion if 30–40% of U.S. orders pass through next-generation robot-centric centres; this directly increases OEE and lowers per-package handling costs [23].

In retail, Nike uses computer vision in its Nike Fit service: foot scanning via a mobile app creates a 3-D model and provides exact shoe sizing; the company reports a substantial reduction in returns, and industry reviews note that incorrect sizing underlies most fashion-item returns, so reducing this rate directly extends CLV and frees working capital [24].

At Starbucks, the Deep Brew predictive platform personalizes offers for 34.3 million active Rewards members. In 2024, the base grew by 13% year over year, and the CEO attributes increased visit frequency and average ticket size to AI-generated targeted offers; this is reflected in metrics as simultaneous increases in CLV and reductions in marketing CAC due to higher conversion of existing customers [25].

Thus, across industries, AI demonstrably improves fundamental performance indicators: in manufacturing, OEE and energy costs; in logistics, order-handling costs; and in retail and food service, return rates, visit frequency, and customer lifetime value. The consistent factor in all successful cases is measured pre- and post-implementation metrics, preventing the conflation of technological enthusiasm with real productivity gains.

Multinationals reap the most significant AI benefits for long-term competitiveness where the technology accelerates innovation cycles, makes personalization the default, and enhances supply-chain flexibility. Breakthrough models such as Gemini already act as in-factory co-scientists: Google demonstrates how the new version generates hypotheses for drug development, reducing lab iteration timelines from months to days [26]. In the consumer sector, Unilever uses digital twins of packaging and formulations, enabling marketing teams to produce photorealistic content without physical photoshoots and to launch new products faster than competitors can secure studio time [27].

New constraints accompany this accruing advantage. First, regulatory costs: the EU AI Act mandates testing, audit, and registration of high-risk systems [28]. Second, the capital intensity of infrastructure: IDC forecasts that global spending on AI-supporting technologies will reach USD 337 billion by 2025, a significant portion of which will go to specialized GPU clusters and cooling [5]. The hype cycle effect remains a real threat: Gartner places most generative tools at the peak of inflated expectations and notes rising project withdrawals due to the gap between demo potential and operational readiness; analysts warn that without clear business metrics and systematic risk management, firms risk entering the trough of disillusionment and losing investment momentum [29]. Collectively, this indicates that sustainable competitive advantage is shaped not merely by AI adoption per se, but by a firm's ability to extract value simultaneously from rapid innovation, personalization, and flexible supply chains—and, critically, to systematically mitigate the regulatory, financial, and organizational costs that inevitably accompany a technological leap.

In summary, this analysis demonstrates that implementing AI solutions in manufacturing, logistics, retail, and services leads to significant improvements in key metrics—from labor productivity and OEE to reduced TTM and increased CLV—in the cases of Google, Amazon, Nike, and Starbucks, and that by accelerating innovation cycles and personalization, firms secure additional competitive dividends. At the same time, long-term advantage is achieved only through strict adherence to measurable KPIs and proactive management of the regulatory, financial, and organizational costs that invariably accompany the digital leap. The concluding section will formulate practical recommendations and strategic insights for multinational enterprises seeking to convert AI's potential into sustainable economic superiority.

CONCLUSION

In the present study, it has been demonstrated that large-scale implementation of artificial intelligence technologies in multinational corporations yields short-term economic effects, such as revenue growth, reduced operating costs, and increased returns on capital and labor, but also lays the groundwork for sustainable competitive advantage. Analysis of industry reports and empirical cases (Google, Amazon, Nike, Starbucks) confirmed that precise measurement of key indicators before and after implementation (OEE, labor productivity, TTM, CLV, etc.) enables objective evaluation of AI initiatives' effectiveness and prevents digital enthusiasm without real returns. Macroeconomic forecasts by McKinsey and PwC point to trillions of dollars in added value and waves of GDP growth. However, they also emphasize that, without coordinated efforts to develop infrastructure, competencies, and flexible organizational mechanisms, these figures risk remaining potential rather than realized impacts.

From the perspective of the resource-based theory of the firm, unique data, algorithms, and computing power meet the VRIN criteria and become strategic barriers to market entry. At the same time, research on organizations' dynamic capabilities underscores that technology alone—absent the organizational reflex and the ability to sense, seize, and transform new opportunities—will not lead to sustainable growth. The fact that 74 % of companies failed to scale pilot projects illustrates the risk of a gap between proven utility and mass adoption [14].

These findings provide practical recommendations for multinational enterprises. First, AI solutions must be integrated into strategic frameworks—from supply chains to product development and customer-facing operations—and each project should be aligned with specific KPIs. Second, firms should establish internal processes for training and disseminating competencies to ensure a rapid response to market changes and technological shifts. Third, regulatory requirements, financial risks, and the hype cycle should be anticipated by implementing robust audit, testing, and expectation management systems.

In conclusion, we emphasize that a complete transformation under AI influence is possible only through a systemic approach: combining technological investments with the development of dynamic capabilities and rigorous control of economic, organizational, and regulatory dimensions. Such a synergistic approach will enable multinational corporations to achieve isolated technological successes and secure long-term competitive advantages in the face of intensifying global competition.

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