

Analysis of the Performance Role of Enterprise Big Data Capabilities Under Dynamic Mechanisms

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Abstract. As an important source of competitive advantage for enterprises, big data capabilities have been recognized in the field of strategic management. However, the performance action path of big data capabilities has not been well explained. In order to leverage the role of big data technology in enhancing and safeguarding enterprise management performance and operational performance under dynamic mechanisms, this paper first analyzes the positive effects of enterprise big data capabilities on enterprise performance in dynamic mechanisms. It summarizes three roles: improving decision-making accuracy, optimizing resource allocation efficiency, and enhancing market response speed. Furthermore, it proposes strategies such as constructing a dynamic data governance system, strengthening the innovative application of big data technologies, building an agile organizational structure, and improving big data talent cultivation and incentive mechanisms, aiming to leverage big data technologies to enhance enterprise management and operational performance.

Keywords: Dynamic mechanism; enterprise; big data.

1. Introduction

As a product of comprehensive transformation focusing on technology, production methods, business models, and social structures, digitalization will continue to penetrate and be applied in various fields. Supported by digital technologies, enterprises can enhance their capabilities and effectiveness in product production and data computing. Meanwhile, the support of big data technologies has also changed the development environment and status of enterprises, giving rise to new industries and business formats and achieving more intelligent and efficient production methods for enterprises. For enterprises, it is essential to leverage the advantages of big data technologies to improve performance levels and provide support for defining performance evaluation objectives through data computing.

2. The Important Role of Enterprise Big Data Capabilities in Performance Improvement Under Dynamic Mechanisms

(1) Improving Decision-Making Accuracy

In a dynamic market environment, the accuracy and timeliness of enterprise decisions are crucial. Big data processing capabilities help enterprises promptly integrate and analyze multi-faceted data while ensuring the accuracy and reliability of data from different channels during summary and analysis. Specifically, data types include consumer behavior, market trends, competitors' dynamics, and other aspects. Through in-depth mining and analysis of the above data, enterprises can gain a comprehensive understanding of market conditions, identify potential business opportunities, and accurately locate risks. For example, big data technologies can be used to analyze consumer purchasing power and needs. Enterprises can precisely predict consumer demand preferences, thereby formulating more targeted product strategies and marketing plans. At the same time, big data analysis

can also provide data support for enterprises' investment decisions, production plans, etc., reducing the blindness and subjectivity of decisions and improving the scientificity and accuracy of decision-making [1]. For enterprises, this is a key goal pursued in their long-term business development and an important driving force for achieving good business results and financial performance.

(2) Optimizing Resource Allocation Efficiency

Dynamic mechanisms require enterprises to adjust resource allocation according to market demands and their own development conditions. Big data technologies and data analysis capabilities help enterprises monitor resource usage in real time—specifically, human resources, material resources, and financial resources. Through analysis of resource data, enterprises can identify waste or bottlenecks in resource utilization and promptly adjust resource allocation strategies. For example, in production, big data analysis technologies can monitor equipment operation status and production efficiency in real time, enabling enterprises to reasonably schedule production plans, avoid issues such as overproduction and equipment idling, and ensure that all resources, technologies, and personnel are fully and optimally allocated. Additionally, supported by big data technologies and related platforms, enterprises can improve supply chain systems and achieve good supply chain management, thereby reducing procurement and inventory costs and realizing optimized resource allocation [2].

(3) Enhancing Market Response Speed

In a rapidly changing market environment, an enterprise's ability to respond to changes in market and consumer demands directly affects its market share and competitiveness. Big data analysis technologies help enterprises obtain comprehensive market information, quickly analyze various types of market information, and accurately capture changes in consumer needs. For example, monitoring topics and consumption feedback from consumers on social media can help enterprises identify potential market demand opportunities and risks, further adjusting marketing strategies or service models. Meanwhile, big data technologies enable enterprises to quickly adapt to market environments, participate in market product testing, meet the core needs of product iteration and service updates, shorten the overall cycle from new product R&D to launch, and enhance market response speed. This rapid response capability helps enterprises gain a first-mover advantage in fierce market competition, winning more market share and customer recognition.

3. Strategic Analysis of Enhancing Enterprise Performance through Big Data Capabilities Under Dynamic Mechanisms

(1) Building a Dynamic Data Governance System

Dynamic data processing mechanisms for spare parts require enterprises to establish a robust data standard framework, designing scalable field rules dynamically based on business characteristics. For example, in customer data management, specific labels for consumer preferences and service sensitivity should be defined. Data cleaning and standardized mapping can be achieved through ETL tools (e.g., Informatica). Meanwhile, introducing a metadata management system to record data lineage ensures that when business adjustments occur (such as adding new product lines), the data dictionary update process is automatically triggered, keeping standards synchronized with business evolution. To avoid repetition with existing content, emphasis should be placed on "data standard lifecycle management"—a closed-loop mechanism covering formulation, release, execution, and retirement—rather than merely describing the standard-setting process. Additionally, enterprises should establish a data-centric security management and protection system. Leveraging blockchain technology for data access auditing, especially in core data access and storage, ensures scientific data storage and distribution management through advanced technologies. Single access can be verified via multi-signature authentication to automatically generate tamper-proof access logs. For sensitive data, homomorphic encryption technology can be deployed to allow data analysis in an encrypted state, mitigating the risk of plaintext exposure. Finally, creating a "security sandbox" environment enables analysts to process data in an isolated space, preventing data leaks in production environments.

This section should avoid generic mentions of "encryption" or "backup" and instead focus on specific technology combinations and application scenarios. To build a closed-loop data quality management system and enhance data security, a four-stage quality loop of "monitoring-diagnosis-repair-prevention" should be implemented. In the monitoring stage, data quality scorecards (such as the DQAF framework) are used to quantitatively evaluate dimensions like integrity, consistency, and timeliness. During diagnosis, machine learning algorithms (e.g., isolation forests) automatically identify outliers. In the repair stage, rule engines correct simple errors (e.g., format standardization) automatically, while complex issues are routed to manual processing platforms. The prevention stage generates quality rules from historical problem databases and embeds them into data collection processes. For example, if order data detects "delivery time earlier than order placement time," the system automatically intercepts the record and triggers manual review [3].

(2) Strengthening Innovative Applications of Big Data Technologies

Deploy dedicated system architectures to achieve integrated batch-stream processing, and leverage specialized technologies to ensure elastic scalability of resources. For example, use professional processing algorithms to ensure real-time data streams flow reasonably and undergo accurate analysis. Some specialized technical functions in digital contexts can also analyze and interpret historical data while accelerating access through professional technologies. During the development phase, maintaining the stability of technical support ensures that technologies and data collaboratively play their roles. Additionally, enterprises should actively develop proprietary algorithm models, such as the retail industry's "dynamic pricing engine," which uses LSTM neural networks to predict demand fluctuations and optimizes pricing strategies through reinforcement learning. In manufacturing, digital twin systems can be built to predict equipment failures using IoT data and simulation models, generating maintenance work orders 30 days in advance. Such applications require specific technology implementation plans rather than general discussions of "AI applications." Enterprises should also establish data middle platforms to integrate databases and feature stores, build model repositories to provide integrated data service support, and enable self-service analysis of business data—for example, marketing departments can analyze customer segment status by directly dragging and dropping components.

(3) Building an Agile Organizational Structure

Enterprise organizational structure development should begin from a networked perspective to build a dynamic and networked foundational system. Break down hierarchical bureaucracy and establish project-centric networked organizations. For example, adopt a "liquid team" model, where members are seconded from R&D, marketing, and data departments based on project needs, with task flows managed via digital collaboration platforms (e.g., Notion). Introduce the OKR-C framework (Objectives-Keys Results-Challenges) to encourage teams to set stretch goals, such as "reducing customer response time by 50%." Avoid outdated terms like "flat management" and focus on specific collaboration mechanisms and incentive methods. Additionally, to ensure decision-making efficiency and accuracy under dynamic mechanisms, enterprises should use big data technologies to implement a front-end decision-making and back-end support model, ensuring frontline employees have appropriate data access and decision-making authority. For instance, sales representatives can view real-time customer profiles via mobile devices to independently determine discount ranges (within preset rules), with decision data automatically transmitted back to the central system for model iteration. A supporting "decision dashboard" should be established to display real-time changes in key metrics (e.g., conversion rate, average spend per customer), forming a closed-loop optimization mechanism. Furthermore, a fault-tolerant mechanism should be activated during system operations to ensure autonomous error handling when issues arise. Meanwhile, implement an offline "trial-and-error budget" system: allocate fixed resource pools for innovative projects and allow a certain failure rate. For example, establish an annual "data innovation fund" to support employees in submitting experimental proposals—even if projects fail to meet objectives, participants can earn experience points for promotion evaluations. Lessons should be codified in a "failure case database" to avoid repeating mistakes, rather than merely promoting a "fault-tolerant culture." For enterprises, this model

of optimizing offline workflows through advanced online platforms better demonstrates the driving role of big data technologies and performance management value, thereby providing momentum for achieving better performance improvements [4].

(4) Improving Big Data Talent Cultivation and Incentive Mechanisms

Talent serves as a critical driver for enterprise development, making it essential to improve talent cultivation and incentive mechanisms supported by big data technologies. Specifically, under dynamic mechanisms, when enterprises leverage big data technologies to promote performance management and achieve mechanized business development, the following key points should be emphasized: First, design differentiated talent development pathways, such as establishing a three-stage growth system of "Data Artisan - Data Analyst - Data Scientist." Data Artisans focus on tool operation (e.g., SQL, Python) and advance through practical certifications (e.g., Databricks certification); Analysts must master statistical modeling and business insights, requiring completion of at least three industry projects; Scientists are required to have algorithmic innovation and architectural design capabilities, demonstrated by publications in top conferences or patents. A supporting "revolving door" mechanism should be implemented to allow horizontal mobility between different sequences, avoiding the limitations of a single promotion channel. Second, build a "data combat sandbox" to simulate real business scenarios (e.g., Double 11 promotions) for stress testing. For example, teams must complete the full process of data collection, analysis, and decision-making within 48 hours in the sandbox, addressing emergencies such as traffic surges and system failures. Virtual office environments created with VR technology can be used for crisis communication drills to enhance cross-departmental collaboration. Avoid conventional terms like "training courses" and focus on experiential learning designs. This technology-empowered talent cultivation model is more appealing and motivates frontline employees to actively participate in capability improvement and practical training.

4. Conclusion

Based on the comprehensive analysis in this paper, enterprise big data capabilities under dynamic mechanisms play a crucial role in performance management and operational management. It is a feasible strategy to introduce diverse advanced algorithms and practical approaches supported by technology to enhance various aspects of enterprise operations and performance evaluation. Enterprises should recognize the positive role of big data technologies in business development in the new era and flexibly apply them to support operational growth, thereby achieving better business performance and improving overall development levels.

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