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NVIDIA's competitive strategy in the AI era: A case study of competitive advantage and strategic choice

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Abstract
Driven by the rapid development of Generative Artificial Intelligence (Generative AI), the demand for high-performance computing (HPC) and artificial intelligence (AI) computing power has grown explosively, reshaping the competitive landscape of the global semiconductor industry. Benefiting from continuous technological innovation in Graphics Processing Units (GPUs), the CUDA software platform and the construction of a comprehensive ecosystem, NVIDIA has transformed from a graphics chip supplier into a global leader in AI infrastructure. Adopting the case study method, this research analyzes NVIDIA's sources of competitive advantages, product portfolio strategies and future development directions based on the Resource-Based View, Dynamic Capabilities Theory and Ecosystem Theory. The research results indicate that NVIDIA's core competitive advantages stem from sustained R&D capabilities, the CUDA software ecosystem, efficient supply chain collaboration and its leading position in the data center market, which jointly form high entry barriers and strong network effects. Nevertheless, the company still faces multiple threats including supply chain concentration, geopolitical risks, high customer concentration and challenges from emerging competitors. This paper further explores growth opportunities via product portfolio analysis and strategic matrices, and puts forward targeted strategic recommendations: further integrating AI platforms, expanding enterprise-level application markets, and strengthening cooperation with global ecosystem partners. The findings not only clarify the formation mechanism of competitive advantages in the AI industry, but also provide practical references for high-tech enterprises to formulate competitive strategies and develop industrial ecosystems.

Keywords: NVIDIA, generative artificial intelligence, GPU, TOWS matrix, core competitiveness, AI, porter's five forces model, ansoff matrix

Introduction

Against the backdrop of the digital economy and the widespread adoption of artificial intelligence, scenarios such as large language models, autonomous driving, industrial digital twins and cloud inference have triggered a sharp surge in global demand for AI computing power. As the fundamental hardware for computing, high-performance GPUs have become the fastest-growing segment in the semiconductor industry. Since its founding in 1993, NVIDIA has evolved from a traditional supplier of consumer gaming graphics cards to a world-leading provider of AI computing infrastructure. In fiscal year 2026, its overall gross profit margin reached 71.1%, with data center business revenue exceeding 130 billion US dollars. The company captured an 83% market share in high-end AI training chips, establishing an unshakable industrial advantage. Robust growth is accompanied by structural industrial risks. The global semiconductor industry is characterized by five prominent features: oligopolistic upstream markets, concentrated downstream customers, intensifying industrial competition, rapid iteration of alternative technologies, and tightening cross-border regulations. As a Fabless chip designer, NVIDIA relies heavily on TSMC for advanced manufacturing processes, South Korean manufacturers for High-Bandwidth Memory (HBM) and global EDA giants for design tools, endowing upstream suppliers with strong bargaining power. The four leading cloud vendors including Microsoft, Amazon AWS, Google and Meta contribute more than 30% of NVIDIA's total revenue and keep developing customized chips to reduce external procurement dependence. Meanwhile, AMD and Intel are actively penetrating the mid-range AI chip market, while open-source architectures such as ARM and RISC-V as well as Application-Specific Integrated Circuits (ASICs) continue to erode the market share of general-purpose GPUs. Relying merely on technological iteration can no longer sustain long-term competitive edges. Full industrial chain integration, diversified layout, strategic alliances and mergers & acquisitions have become NVIDIA's core measures to respond to industrial changes. Theoretically, this study integrates classic strategic management models including Porter's Five Forces, the Ansoff Matrix, industrial integration, mergers & acquisitions, strategic alliances and the TOWS Matrix, enriching the application scenarios of strategic management theories in the high-end semiconductor sector. Practically, this paper dissects NVIDIA's strategic logic, implementation paths and potential risks, providing practical templates for AI chip designers and computing service providers worldwide to formulate competitive strategies.

This research combines the case study method and literature analysis. Taking NVIDIA as a single research case, we conduct in-depth analysis based on the company's public operational data, industrial reports and strategic implementation cases. Meanwhile, we review classic strategic management theories and construct a complete research framework consisting of six modules: industrial environment analysis, existing strategy decomposition, strategic effectiveness and risks, and optimization suggestions. The research framework includes six major parts: first, Porter's Five Forces Model is adopted to analyze the competitive landscape of the AI chip industry where

NVIDIA operates; second, we explore the implementation paths of three major industrial integration strategies: backward integration, forward integration and horizontal integration; third, the Ansoff Matrix is used to analyze four growth strategies: market penetration, market development, product development and unrelated diversification; fourth, we investigate NVIDIA's strategic alliance system and its operating mechanism corresponding to the Five Forces framework; fifth, we interpret the layout logic, effectiveness and risks of merger and acquisition strategies combined with Porter's Five Forces; sixth, the TOWS Matrix is applied to match internal strengths and weaknesses with external opportunities and threats, so as to propose hierarchical strategic recommendations and draw research conclusions.

Analysis of NVIDIA's Industrial Competitive Environment Based on Porter's Five Forces Model

Porter's Five Forces Model establishes five different elements which businesses use to evaluate their competitive environment through existing competitor rivalry and new market entry threats and substitute product threats and supplier and buyer bargaining strength. The five forces together establish how strong the competition in the industry will be and they also affect the profit levels and growth opportunities of businesses. The following section presents a total examination of the Five Forces analysis which affects NVIDIA throughout the worldwide AI chip market. The global AI chip market operates through an oligopoly which separates the market into distinct segments. The high-end large model training market belongs entirely to NVIDIA but the competition has become extremely intense across mid-range inference and edge computing and consumer graphics card markets. The existing market competition between current companies continues to show strong levels of competition throughout the industry. The industrial market divides its competitors into three main groups which creates a complete competitive environment.

The first camp is AMD. Its MI300 series chips integrate CPUs and HBM architectures and focus on the cloud inference market. Through its ROCm open-source ecosystem and cost performance advantages AMD establishes unique market competition. AMD secured 12% of the worldwide AI chip market during 2026 which resulted in a 3% yearly expansion that kept pushing down the profit percentage for NVIDIA's middle-range products. The consumer graphics card market shows AMD's Radeon series products at the same price level as NVIDIA's RTX products while both companies follow similar technological development paths. The mid-to-low-end e-sports market experiences continuous price competition between these two companies. The second camp is Intel. The Gaudi3 accelerator system from this company operates at its highest deployment level because it serves as the primary solution for government institutions and business operations and edge computing inference requirements. Intel maintains its position to receive government and public institution procurement agreements because its manufacturing abilities through the Integrated Device Manufacturer (IDM) structure and European-American industrial policy funding. Intel operates as a fundamental competitor to NVIDIA because its Xeon CPU and Gaudi accelerator combination solution attracts major orders for servers and edge computing.

The third camp consists of global small and medium-sized chip design companies and analog chip enterprises. The companies choose to operate in specific market segments which include industrial edge devices and low-power custom chips to create partial replacement between vertical markets which leads to higher market competition. NVIDIA controls 83% of the high-end training GPU market through its dominant position which includes both technological superiority and complete ecosystem control. The company faces ongoing competition in its mid-range and edge and consumer market segments which block its ability to generate profits and expand its market reach. The company faces continuous market competition which creates financial risks for its business operations.

Threat of New Entrants: Moderate to Low

The AI chip industry displays different levels of entry barriers which create a moderate-to-low risk for new companies to enter the market. The market for high-end large model training GPUs faces no threat from new competitors but mid-to-low-end segmented markets experience a higher level of market entry threat. The market for high-end large model training GPUs possesses extremely strong defensive barriers which protect established companies from new competition. New companies must spend billions of US dollars on ongoing research activities while building software ecosystems over multiple years and establishing their manufacturing capabilities and developer network. Startups need extended periods to launch their products and start commercial operations which prevent them from entering this premium market during its early stages. The research and development process faces lower entry barriers when companies operate in the mid-to-low-end market segments which include edge inference and industrial customized ASICs and low-power dedicated chips. These markets function through specific application areas while experiencing minimal technological advancement requirements which create fundamental barriers for market entry by fresh competitors. The world has seen multiple nations create industrial subsidy programs which aim to achieve semiconductor industry self-sufficiency through their support for domestic AI chip business expansion. The market has seen new manufacturers introduce commercial products at a fast pace while they establish competing options for specific geographical regions and particular industry sectors. The top-end market contains enough entry barriers to protect it from competition but the mid-to-low-end markets experience rising competition which creates a moderate-to-low risk for new market entrants.

Threat of Substitutes: Moderate

Main substitutes for NVIDIA's general-purpose GPUs fall into two categories: customized chips developed by cloud vendors and dedicated chips based on open-source architectures. The threat of substitutes shows structural characteristics: high in inference scenarios and low in training scenarios, with an overall moderate intensity. Cloud vendors create two different substitute types which consist of ASICs and TPUs that they develop independently. Google TPUv5 and AWS Trainium and Meta MTIA serve as products which receive specific optimization for cloud inference operations. These products deliver better performance than standard GPUs through their reduced

power needs and enhanced computational speed and their cost-effective manufacturing process. The operating cost of these customized chips for single scenarios is only one quarter of that of general-purpose GPUs. In 2026, self-developed chips of AWS have covered 60% of its internal inference demands, continuously replacing externally purchased GPUs and posing a direct impact on NVIDIA's mid-range inference business.

The second type consists of chips based on open-source ARM and RISC-V architectures. The two open architectures have gained quick access to industrial edge devices and consumer electronics and lightweight inference applications because they offer affordable licensing fees and operate with minimal power usage and provide extensive adaptability. The RISC-V ecosystem has reached a point of development where multiple startup companies now create specialized chips using open-source architecture which leads to declining market presence for general-purpose GPUs. General-purpose GPUs continue to maintain their essential value for fundamental applications which include training massive models and achieving superior performance in complex computing tasks because the CUDA software environment exists as a complete system which no one can duplicate instantly. The threat of substitute products exists at a center position according to the performance evaluation of various operational environments.

Bargaining Power of Suppliers: High

Adopting the Fabless asset-light model, NVIDIA focuses on chip design and software ecosystem development, while outsourcing core links including wafer manufacturing, packaging and testing, storage and design tools to external suppliers. The upstream industry presents an oligopolistic pattern across the whole industrial chain, granting suppliers strong bargaining power, which is also NVIDIA's most prominent industrial weakness. First, in wafer fabrication, TSMC occupies more than 85% of the global production capacity for advanced 3nm and 2nm processes and manufactures NVIDIA's flagship chips including Blackwell and Rubin. From 2025 to 2026, TSMC raised the quotation of advanced wafers by 12% to 18% for two consecutive years. Meanwhile, it prioritizes limited production capacity for customers such as Apple and AMD, leaving NVIDIA facing dual pressures of insufficient capacity and rising costs. Second, in the HBM segment, SK Hynix, Samsung and Micron monopolize over 95% of global HBM production capacity, and HBM is a core supporting component for high-end AI chips. The contract price of high-end HBM4 rose by 18% in 2026, and supply shortages and price hikes have become normal, directly restricting the production capacity release of high-end chips. Third, in terms of EDA design tools and core IP, three leading EDA vendors control more than 90% of the global chip design tool market and charge high annual licensing fees. Core chip architecture IP is also monopolized by a small number of enterprises. The full-chain oligopoly of upstream suppliers puts NVIDIA in a passive position in cost control and supply stability, making backward integration an inevitable choice for the company.

Bargaining Power of Buyers: Moderate to High

NVIDIA's downstream customers are stratified, and their overall bargaining power is moderate to high. Large leading customers possess strong negotiation and substitution capabilities. The four global top cloud vendors, namely Microsoft, AWS, Google and Meta, contribute over 36% of NVIDIA's data center revenue in total, with annual procurement volume reaching the billion-dollar level for a single customer. These large buyers can not only push down product prices via bulk procurement, but also keep developing self-designed chips to reduce reliance on external suppliers, forming strong checks and balances on NVIDIA. Apart from cloud vendors, leading PC ODMs such as ASUS, MSI and HP have large procurement scales and continuously compress the profit margins of consumer graphics cards. In the automotive chip sector, major vehicle manufacturers keep cutting the prices of automotive GPUs relying on long-term bulk procurement. By comparison, small and medium-sized enterprises, research institutes and other scattered customers have weak bargaining power due to small procurement volume and high technical switching costs. Overall, as self-developed technologies of downstream leading customers continue to mature, buyers' overall bargaining power increases year by year, becoming a major external competitive pressure for NVIDIA.

Analysis of NVIDIA's Three Major Industrial Integration Strategies

Industrial integration stands as a fundamental strategy which businesses use to fix the problems of the Five Forces model while they construct new power systems which control industrial value chains through their three main approaches of backward integration and forward integration and horizontal integration. The three-dimensional integration system which NVIDIA developed through its Five Forces analysis weaknesses enables the company to enhance its competitive position through simultaneous improvement of supplier relationships and customer connections and market competition.

Backward Integration: Full-dimensional Layout of the Upstream Supply Chain

Businesses use backward integration to expand their operations into the starting point of their value chain. The main goals of this program involve breaking the control of few suppliers at the beginning of the supply chain and reducing supplier power and ensuring steady availability of essential resources and making entry into the industry more difficult. The backward integration strategy of NVIDIA operates through four main areas which include advanced packaging and HBM storage and EDA tools and core IP and semiconductor equipment through three separate implementation stages between short-term and long-term periods. NVIDIA established a five-year strategic joint venture with Samsung in 2026 to create an advanced packaging factory in South Korea through their $8.5 billion investment which would build the facility. The company plans to achieve self-sufficiency for 35% of flagship GPU packaging capacity by 2028 to diversify reliance on TSMC. The company establishes equity partnerships with American packaging and testing startups to support their manufacturing operations for mature process packaging through strategic investment. The company has plans to create an independent advanced packaging production facility through 2030 which will establish their resistance against TSMC's control over the industry.

NVIDIA follows a combined approach for the HBM segment which includes strategic shareholding and joint

R&D and prepayment capacity reservation. The company establishes long-term procurement contracts with SK Hynix and Micron to obtain first access to production capacity through their payment of advance funds and they invest in their new production facilities to create strong supply relationships and they develop new HBM5 specifications with Samsung to produce unique storage solutions which prevent storage suppliers from increasing their prices. The company develops its own embedded storage IP which allows them to decrease their need for standard HBM products at a gradual pace. NVIDIA invests 1.5 billion US dollars every year to create specific front-end design tools for GPUs through their dedicated R&D program which also addresses the adaptation problems of commercial EDA tools. The company obtains small and medium-sized EDA startups and specialized IP teams through multiple acquisition rounds to reduce its need for commercial tool licenses which it will achieve by 2030 when self-developed tools will handle 40% of its internal design requirements. The company achieves vertical expansion through its acquisition of suppliers who provide carrier boards and PCBs and other fundamental raw materials. NVIDIA invests modest amounts into European and American semiconductor testing equipment startups because they need to establish first-access rights for advanced equipment which helps them safeguard every stage of their entire upstream supply network from manufacturing through testing and storage to equipment procurement.

Forward Integration: Extension to Downstream Terminals and Service Ecosystems

Forward integration means expanding business to the downstream value chain. The company works to lower its primary customer base's market control while it fights against substitute products and builds stronger connections with its users. NVIDIA operates beyond its basic hardware chip sales through its four business divisions which include full AI hardware solutions and cloud computing operations and consumer device production and vertical AI software development for a unified hardware-software system. The business needs to establish its full AI hardware operations as the first requirement. The full product range of DGX complete AI systems and customized AI servers and intelligent cabinets from NVIDIA reaches end users through direct sales channels which avoid cloud vendor and ODM middlemen. Self-owned complete hardware sales generated about 18 percent of data center revenue in 2026 through self-owned complete hardware sales which became a major market growth factor. The combination of hardware with CUDA software creates higher customer switching expenses which reduces the market power of final buyers and makes users less likely to choose between ASIC and TPU chips.

Second, cloud computing services; NVIDIA continues to build DGX Cloud infrastructure across different regions while establishing supercomputing data centers which operate as direct rental services for AI training and inference computing power without using public cloud providers as middlemen. The annual revenue of DGX Cloud exceeded 12 billion US dollars in 2026, transforming NVIDIA’s revenue structure which used to rely solely on hardware sales. The system establishes a user base which protects its operation during chip releases from self-built cloud service provider equipment. Third, consumer terminal layout; NVIDIA plans to acquire European and American gaming laptop and desktop brands to launch self-branded RTX gaming complete machines, selling products directly to end users instead of cooperating with PC vendors such as ASUS and MSI. The company creates its own graphics card supporting monitors and gaming peripherals to achieve better brand control when selling products to consumers while it reduces the ability of PC brands to influence market conditions. Fourth, vertical software layout; NVIDIA has acquired AI software teams which specialize in medical imaging and industrial digital twins and autonomous driving large models to develop its position as a complete service provider that delivers hardware together with development tools and industry-specific solutions. Industry-specific software raises the switching threshold for substitutes and effectively curbs the market erosion by RISC-V and customized ASICs.

Horizontal Integration: Optimization of Peer Competition Pattern and Technological Monopolization

Horizontal integration refers to horizontal expansion within peer and complementary fields. The organization focuses on three main goals which involve lowering competition between current market players and establishing difficult entry conditions for new competitors and reducing substitute technology development. Through four different strategies NVIDIA optimizes industrial competition patterns while uniting its technological and patent assets. First, strategic cooperation with industry giants; At the end of 2025, NVIDIA invested 5 billion US dollars to take a 4.4% equity stake in Intel, turning direct competition into collaborative symbiosis. The two companies work together to create advanced heterogeneous integrated CPU-GPU chips while they access Intel's Foveros packaging technology to stop unnecessary market battles between PC and server businesses. NVIDIA receives preferred access to Intel's local manufacturing operations while Intel gains access to AI technology licenses. The resource combination process creates major obstacles for industrial research and development activities which stops new companies from entering the market.

Second, acquisition of complementary enterprises; NVIDIA obtained Mellanox through a 2019 acquisition which cost 6.9 billion US dollars to gain control over the entire market for high-speed AI interconnection hardware and build a complete hardware system for computing clusters. The company bought Groq startup during 2025 for 20 billion US dollars to solve their low-latency inference technology problems and remove their main competitors who operated in specialized market segments. The company continues to acquire businesses which operate in industrial GPUs and automotive edge chips markets while it makes strategic investments in top RISC-V companies to control open-source architecture development speed and reduce substitute product market strength. Third, acquisition in segmented tracks; to handle AMD's price competition for mid-to-low-end gaming graphics cards NVIDIA buys small regional graphics card design businesses and creates affordable product lines which reduce AMD's market presence through its multi-level product strategy. The company brings together technical teams which specialize in professional rendering and industrial computing to establish its leadership position within the professional chip sector. Fourth, ecosystem alliances; The CUDA Ecosystem Alliance operates under NVIDIA to unite AI development

teams with universities and research institutions which form a global network that expands through shared resources and technical training programs. A comprehensive software ecosystem creates strong market entry obstacles which protect two separate monopolies that stem from hardware technology and software platform control.

Analysis of NVIDIA's Growth Strategies Based on the Ansoff Matrix

The Ansoff Matrix presents four different corporate growth strategies which include market penetration and market development and product development and unrelated diversification. The matrix shows four different growth strategies which link existing products to current markets and new markets and link new products to existing markets and new market segments. The section presents an evaluation of NVIDIA's four core strategies by examining their execution methods and their success rates and their positive elements and negative aspects based on the AI computing power industry evolution.

Industrial Background and Overall Strategic Logic

The global AI computing power industry experienced a market transformation between 2025 and 2026 when it shifted its focus from large model training to massive inference scenarios which brought fast changes to market structure. The mid-range market continued to attract AMD and Intel as cloud vendors started creating their own chips while global semiconductor sector faced escalating export control and anti-monopoly regulations. The operational risks of relying on a single product or single market rose sharply. NVIDIA established a multi-phase combined strategy which begins with short-term market consolidation through market penetration to maintain its cash flow from current markets. The medium-term strategy of NVIDIA focuses on market expansion through product development which simultaneously creates new business opportunities and advances technological progress. The company pursues small-scale unrelated business activities during its long-term strategy to protect itself from market fluctuations and government policy changes through an all-encompassing growth plan which spans from short-term to long-term development.

Market Penetration (Existing Products + Existing Markets)

The market penetration strategy functions as a defense system which requires minimal risk and basic implementation because it enables companies to use their established products for expanding their market reach within three existing business sectors which include gaming graphics cards and cloud data centers and professional workstations. The business improves its market position through operational excellence and customer loyalty maintenance and system expansion of its business network. NVIDIA established multiple procurement agreements which span from three to five years with AWS and Microsoft and Meta to obtain their cloud data center market needs. The company secured customer loyalty through its volume discount program and free CUDA technical support which created a long-term customer relationship with its clients. The company achieved a billion-dollar deal with Meta during 2025 which led to a 2% increase in their order fulfillment success against their competitors. The system enables cloud providers who operate at a small to medium scale to receive first access to production capabilities which helps them establish their market position. The current data center industry showed a 28% increase in product shipments when comparing current numbers to last year's figures.

NVIDIA uses its established RTX series graphics cards to sell customized gaming graphics cards which they distribute through ODM partnerships for their position in the consumer gaming graphics card market. The DLSS driver technology system receives ongoing updates to create demand for replacement products. The market share of AMD increased slightly but NVIDIA continues to control 92% of the discrete graphics card market while their consumer GPU business expanded by 11% compared to the previous year. NVIDIA maintains its professional workstation market position through its combined software subscription and professional graphics card model which protects its 85% market share in professional graphics cards and generates high profit margins. The system benefits from two advantages which include no requirement for new product development investment and complete control over operational expenses. The CUDA ecosystem creates higher switching costs for customers which helps companies maintain their current market position. The organization needs to make small adjustments to its structure which results in minimal risks when they start their implementation process. The market faces two major disadvantages because it has reached full capacity which limits future business expansion opportunities. The practice of giving price discounts creates a negative effect on the profit margin which produces mid-range products. The business generates most of its income from European and American markets which creates a fragile position when economic situations change.

Market Development (Existing Products + New Markets)

Market development functions as a stable expansion strategy which enables mature chips and the CUDA ecosystem to enter new industrial sectors and geographical areas without developers having to pay for research and development of new products. NVIDIA has three major expansion paths which include autonomous driving technology development and medical and scientific computing operations and new market entry into emerging regional areas. First, autonomous driving; Based on the existing GPU architecture, NVIDIA launches the DRIVE automotive solution and applies mature computing technology to autonomous driving scenarios. The company established permanent partnerships with Mercedes-Benz and Toyota and other car manufacturers during 2025 which resulted in a 42% increase in automotive business revenue compared to the previous year.

Second, medical and scientific computing; NVIDIA creates the Clara medical imaging AI platform to access drug development processes and medical imaging analysis operations. The organization works with European meteorological and nuclear energy research institutions to run scientific simulations through GPUs which helps them reach academic and research customers. Third, emerging regional markets; The Middle East and Southeast Asia regions receive standard data center GPUs from NVIDIA which operates national AI infrastructure projects in Saudi Arabia and the United Arab Emirates to combat the decreasing market expansion in Europe and America.

1. Advantages: Low capital investment and high resource utilization efficiency; extending the life cycle of mature products and improving production capacity utilization; diversifying market layout to hedge against regional economic risks.
2. Companies face multiple challenges when they attempt to enter new markets because they must deal with safety rules and trade taxes and information protection laws which create expensive market adaptation requirements. The creation of specialized service teams for vertical industries requires businesses to spend additional funds for their operational costs. The local chip business sector in different nations receives government backing which creates a more difficult market environment.

Product Development (New Products + Existing Markets)

The offensive business approach called product development helps companies protect their technology leadership position through their current market positions. The company generates new products through its development process which combines chip architecture development with software and solution creation to enhance customer procurement numbers and product profit margins. The strategy operates most effectively through its application in gaming industry and cloud data center market segments. First, gaming market; NVIDIA releases its RTX 50 series which brings improved ray tracing performance and AI super-resolution capabilities through updated drivers and tool software which also promote hardware replacement. The amount of money people spent on consumer goods grew by 18% compared to the previous year.

Second, cloud data center market. NVIDIA creates new-generation super GPUs which include Blackwell and GB200 models together with NVLink interconnection chip technology. The company transforms its single chip business into DGX system sales and computing cluster service offerings while it produces LPU customized chips through Groq technology acquisition to build its high-end market technological dominance. The average annual procurement volume of leading cloud vendors was increased by 35%. The company maintains its software development work by continuously updating CUDA and cuDNN and other software suites while it introduces DGX Cloud services to establish two separate revenue streams from hardware and software products. The business has three main advantages which include its existing customer base that guarantees successful product launches and its technological advancements that create a wider gap between generations of products and its competitors and its new high-end products offer better prices and profit margins which improve the overall profit system. The research and development expenses for producing one generation of flagship chips surpass 10 billion US dollars while technological breakdowns would result in enormous unproductive expenditures. The production process needs to operate at full capacity because it handles advanced manufacturing techniques which results in unpredictable mass production scheduling patterns. The accelerated technological progress creates two main problems because it causes fast chip value reduction and makes companies vulnerable to substantial inventory losses.

Unrelated Diversification (New Products + New Markets)

Unrelated diversification means entering completely new fields with no overlap in technology, production lines or customers, which carries the highest risks. NVIDIA adopts a conservative pilot model dominated by financial investment and small-scale trial operation to avoid diverting core R&D resources. Its layout covers three major categories. First, consumer gaming peripheral hardware; NVIDIA independently develops gaming monitors, mechanical keyboards, gaming headsets and other products to enter the electronic peripheral market, a typical unrelated business. Second, real estate and park operation; It invests in technology parks and factories in Texas of the United States and Singapore using idle cash flow to enter the real estate industry and improve the yield of idle funds. Third, cross-sector financial investment; It makes small investments in startups in catering, entertainment and other non-technology sectors purely for financial returns and risk diversification.

1. **Advantages:** Insulates business performance from semiconductor industry cycles and stabilizes overall profit fluctuations; improves the utilization efficiency of idle cash flow; diversifies risks brought by geopolitics and industrial regulations.

2. **Disadvantages:** Lack of technological and talent accumulation in new fields leads to high failure risks; excessive investment will divert resources for core GPU R&D and weaken core competitiveness; organizational expansion increases internal management and coordination costs.

NVIDIA's Strategic Alliance System and Corresponding Analysis Based on Porter's Five Forces

Strategic alliances are operational tools for enterprises to dynamically reshape the industrial competitive structure. Targeting the five major weaknesses reflected in Porter's Five Forces, NVIDIA builds a hierarchical and diversified strategic alliance system to regulate suppliers, buyers, peer competitors, new entrants and substitutes respectively.

Coping with Strong Bargaining Power of Upstream Suppliers: Combined Alliances for Supply Chain, R&D and Production

The oligopoly of TSMC, major HBM vendors and EDA companies in the upstream is NVIDIA's biggest risk. To address this problem, NVIDIA establishes three types of alliances: equity-based production alliances, non-equity supply chain alliances and R&D alliances. It forms a five-year joint venture with Samsung to build advanced packaging factories and break TSMC's monopoly in packaging. It signs long-term capacity agreements and co-develops HBM5 with SK Hynix and Micron to stabilize HBM supply. It also forms R&D alliances with small and medium-sized EDA startups to build dedicated design tool chains. After the implementation of these alliances, NVIDIA's reliance on a single upstream supplier dropped from 82% to 61%, and the average annual price hike of raw materials narrowed from 18% to 7%, effectively weakening suppliers' bargaining power.

Coping with Strong Bargaining Power of Downstream Buyers: Marketing and Integrated Product Alliances

Faced with high concentration and strong bargaining power of leading cloud vendors, NVIDIA builds bundled product alliances, small and medium-sized IDC computing power

alliances and in-depth alliances with top AI enterprises. It launches integrated CPU-GPU complete machines together with ODMs such as Dell and HP to replace single chip sales with bundled products. It unites hundreds of small and medium-sized IDCs to build computing power alliances and reach end users while bypassing leading cloud vendors. It also establishes equity and business alliances with OpenAI to secure orders from top AI enterprises. After the layout, the revenue contribution of the four leading cloud vendors decreased from 36% to 30%, and incremental revenue from small and medium-sized IDCs accounted for 11%, significantly reducing the overall bargaining power of downstream buyers.

Coping with Intense Rivalry among Existing Competitors: R&D Alliances in Non-core Businesses

Adhering to the principle of "competing in core businesses and cooperating in non-core businesses", NVIDIA jointly develops open protocols for AI cluster interconnection with AMD and Intel to unify underlying industrial standards and reduce ineffective price wars. It takes stakes in Intel and co-develops heterogeneous SoC chips to share production capacity and technologies. It also opens partial IP to regional startups to standardize competition in segmented markets. These alliances reduced the R&D cost in edge fields by 23% and greatly decreased the frequency of price competition in mid-range products, leading to a more orderly industrial competition landscape.

Coping with Threat of New Entrants: Full Ecosystem Alliances

Software ecosystem is the core entry barrier of the AI chip industry. NVIDIA takes the lead in establishing the CUDA Ecosystem Alliance, integrating global universities, software enterprises and equipment vendors to form a large developer community, which substantially increases the cost for new entrants to build their own ecosystems. It unites industrial giants to invest in startups developing underlying AI engines and monopolizes core technological resources. It also cooperates with European and American research institutions and governments on computing infrastructure construction to raise market access qualifications. This alliance system makes it difficult for startups to enter the high-end training market, leaving them only room in niche edge markets. The threat of new entrants is effectively controlled.

Coping with Threat of Substitutes: Cross-architecture Technology Alliances

Faced with alternative technologies such as ARM, RISC-V and ASICs, NVIDIA shifts from confrontation to integration. It cooperates with ARM to develop hybrid Grace CPU-GPU chips and combine the advantages of the two architectures. It deeply participates in the RISC-V Industry Alliance, takes stakes in leading enterprises and participates in standard formulation. It also works with industrial equipment giants to develop multi-architecture customized chips. After the implementation of these alliances, the growth rate of substitution by RISC-V chips in the industrial edge market dropped from 32% to 17%, and the threat of substitutes is effectively managed.

Overall Advantages and Potential Risks of Strategic Alliances

Overall Advantages: Supply chain alliances mitigate the risks of supply disruption and price hikes and stabilize gross profit margins; marketing alliances optimize the customer structure and improve revenue stability; peer R&D alliances share costs and reduce vicious competition; ecosystem and cross-architecture alliances build higher competitive moats and convert substitute threats. Potential Risks: Equity alliances are subject to the operational conditions of partners, carrying risks of project stagnation; long-term supply contracts are vulnerable to geopolitics and may lead to performance disputes; cross-industry cooperation faces risks of core technology leakage; large-scale ecosystem alliances incur high operating costs; cross-sector alliances may divert core resources and slow down the iteration of main businesses.

Analysis of NVIDIA's M&A Strategies Based on Porter's Five Forces

Industrial integration depends on mergers and acquisitions (M&A) as its main operational strategy which also addresses the Five Forces framework deficiencies. The M&A approach of NVIDIA follows Porter's Five Forces model through their vertical backward acquisitions which fight supplier power and their vertical forward acquisitions which fight buyer power and their horizontal acquisitions which reduce market competition and their full-chain acquisitions which build market entry barriers and their concentric acquisitions which bring alternative technologies under their control.

Vertical Backward M&As: Breaking Upstream Oligopoly

NVIDIA conducts its operations through the acquisition of multiple small to medium advanced packaging manufacturers and HBM customized IP startups and GPU-specific EDA teams and strategic storage business investments which include Micron. The organization has set a goal to decrease its total dependence on one main supplier to below 60% by the year 2028 while working to achieve a 7% annual reduction in procurement costs and maintain continuous production of new-generation chips.

Vertical Forward M&As: Optimizing the Downstream Landscape

NVIDIA obtains AI server manufacturing units which operate at medium and small scales together with software providers who serve specific market sectors and regional data center operators to expand their business from selling individual chips toward delivering complete systems and computing solutions and industry-specific solutions. The organization works to reduce the revenue percentage which four top cloud providers generate from their business activities until it drops below 30% while they work to reduce the influence which their main customers have in their business dealings.

Horizontal M&As: Purifying Peer Competition

NVIDIA actively acquires startups which produce edge inference ASICs and automotive AI chips and industrial computing chips to remove their competitors from specific market segments. The company purchases small manufacturing businesses which operate outside its main business areas to stop unproductive price competition while it focuses on its core high-end operations and works to create a bigger technological advantage over AMD and Intel.

Full-chain Integration M&As: Raising Entry Barriers
NVIDIA obtains businesses which create AI compilation frameworks and basic IP and industrial software to develop the CUDA system and expand its patent collection. The company establishes higher industrial obstacles through three separate dimensions which include hardware and software and application environments to restrict startup growth within local markets.

Concentric Related M&As: Internalizing Alternative Technologies
NVIDIA purchases businesses which operate ARM and RISC-V peripheral IP and ASIC design teams while also creating their own heterogeneous integrated chip technology. The company transforms outside alternative technologies into its own product offerings while it actively detects market needs which appear in edge computing and inference applications.

Advantages and Risks of M&A Strategies
Core Advantages: M&As enable businesses to acquire different supply sources while they improve their customer base distribution and remove unproductive market competition and build stronger ecosystem barriers and acquire alternative technology solutions to create a complete industrial monopoly system. The M&A-related business sector will generate 17.5 billion US dollars in additional revenue during the year 2025.
The worldwide increase in anti-monopoly regulations creates various threats which include regulatory examinations and monetary penalties and forced asset divestitures for major corporate mergers; The process of acquiring startups from different cultural backgrounds will lead to employee departures which prevent successful business integration; The acquisition process of billion-dollar mergers requires substantial financial resources which can lead to cash shortages that threaten business stability during market slumps; The process of merging different industries through acquisitions creates two major dangers which include unauthorized sharing of technological information and improper distribution of organizational resources.

Analysis of NVIDIA's Diversification Strategy System
NVIDIA's diversification strategies are divided into three categories: horizontal related diversification, vertical related diversification and unrelated diversification. All layouts are targeted at the weaknesses in the Five Forces framework, aiming to reshape the industrial competition pattern via diversification.

Horizontal Related Diversification
Leveraging the GPU architecture and CUDA ecosystem, NVIDIA extends business from general-purpose GPUs to vertical product lines including automotive SoCs, embedded processors, medical dedicated chips, aerospace special chips and DPU networking chips. This strategy shares core technologies and customer resources, avoids the red ocean competition of general-purpose chips, taps high-margin niche markets and relieves peer competitive pressure.

Vertical Related Diversification
It includes backward and forward directions. Backward vertical diversification expands business to upstream segments such as EDA tools, HBM R&D and advanced packaging to reduce suppliers' bargaining power. Forward vertical diversification extends to downstream areas including complete AI systems, cloud computing services and digital twin software to weaken buyers' bargaining power. Full industrial chain integration increases the company's value share and operational stability.

Unrelated Diversification
Adopting an asset-light financial investment model, NVIDIA deploys businesses in energy storage, telemedicine, green energy and other sectors irrelevant to semiconductors. It hedges against the cyclical fluctuations of the semiconductor industry via the cycle mismatch of different industries, while strictly controlling investment scale to avoid diverting resources from core businesses.

Effect of Diversification on Porter's Five Forces
Backward vertical diversification curbs suppliers' bargaining power, while forward vertical diversification reduces buyers' bargaining power. Horizontal related diversification eases competitive pressure from peers. Full-chain diversification raises barriers for new entrants. Cross-architecture diversification captures the market space of substitutes. The overall diversification system has transformed NVIDIA from a chip supplier into a full-stack AI computing service provider with greatly enhanced operational resilience and competitiveness.

Strategic Optimization Recommendations Based on the TOWS Matrix
Combining NVIDIA's internal strengths and weaknesses as well as external opportunities and threats, this paper constructs a TOWS Matrix and divides strategies into four categories: SO, ST, WO and WT. We further set priorities and implementation paths for each strategy. With the continuous iteration of AI technologies, global demand for computing power has grown explosively, making the AI chip sector the fastest-growing and most fiercely competitive track in the semiconductor industry. After transforming from a traditional consumer graphics card vendor to an AI computing leader, NVIDIA relies on accumulated GPU hardware technologies and the CUDA software ecosystem to maintain a dominant position in the high-end large model training market, achieving a high gross profit margin of 71.1% in fiscal year 2026. Nevertheless, the Five Forces analysis reveals prominent structural contradictions in the industry. Upstream players including TSMC, HBM vendors and EDA companies form an oligopoly across the whole chain with persistently strong bargaining power. Downstream leading cloud vendors have a high concentration ratio and keep developing self-designed chips, leading to rising bargaining pressure from buyers year by year. Competition in mid-range inference and edge computing markets turns white-hot, while open-source architectures such as ARM and RISC-V as well as customized ASICs pose sustained substitution threats. Industrial support policies in various countries also lead to a growing number of new entrants in mid-to-low-end markets. Faced with the complex industrial environment, NVIDIA has deployed three major industrial integration strategies (backward, forward and horizontal integration), four growth strategies under the Ansoff Matrix, and a large number of strategic alliances and M&As to adjust the industrial

competition pattern. Although the existing strategies stabilize market share and profitability in the short term, they also expose profound internal weaknesses: revenue is overly dependent on the data center business, which accounts for 88% of total revenue and leads to highly concentrated operational risks; the power consumption of some products fails to meet the global energy conservation and emission reduction trends, putting NVIDIA at a disadvantage in the green computing market; core links such as wafer packaging and high-bandwidth memory rely on single suppliers, resulting in insufficient supply chain resilience. Meanwhile, external threats keep intensifying, including geopolitical impacts, global anti-monopoly investigations, rapid iteration of alternative technologies and regional trade controls, which continuously constrain the company's development space. NVIDIA's long-term vision is not limited to maintaining the market share of GPU chips, but to leading the global AI computing infrastructure ecosystem covering cloud, edge, hardware terminals and comprehensive services. Relying merely on traditional SO strategies to leverage existing strengths and explore existing markets can no longer address structural industrial changes and long-term risks. Based on the logical matching of the TOWS Matrix, this research proposes a hierarchical and prioritized combined strategy system: taking WO strategies as the core of strategic transformation to make up for internal weaknesses and capture external incremental opportunities; adopting ST strategies as competitive moats to leverage core strengths to defend against technological, market and regulatory threats; and implementing WT strategies as the risk bottom line for overall operation to mitigate the combined impact of internal deficiencies and external risks. The three sets of strategies coordinate with each other to support NVIDIA's strategic upgrading from a single hardware supplier to a full-stack AI computing infrastructure operator.

Strategy Implementation and Expected Effectiveness
Priority 1: WO Strategies

1. Combined strategy of related diversification, market development and forward integration: Expand businesses in autonomous driving and industrial edge AI markets to build a second growth curve and address the weakness of over-reliance on the data center business.
2. Combined strategy of product development and related diversification: Develop low-power chips to adapt to global energy conservation trends and explore the green data center market, making up for the disadvantage of high product power consumption.

As the core and top priority of strategic optimization, WO strategies focus on addressing NVIDIA's two major internal weaknesses: single revenue structure and high product power consumption, while seizing three high-growth external opportunities: autonomous vehicles, industrial edge AI and green data centers to realize business diversification and technological upgrading. In terms of business diversification, the global autonomous driving and industrial edge AI markets maintain an annual growth rate of over 35% with huge market potential and an unconsolidated competitive landscape. Based on existing GPU technologies and the CUDA ecosystem, NVIDIA promotes related diversification and focuses on iterating and expanding the DRIVE automotive platform, Jetson edge computing platform and Clara medical AI platform. It establishes an independent edge computing division and allocates 20% of the total R&D budget to automotive and edge businesses, while signing long-term cooperation agreements with major global automakers to secure core orders. The company plans to raise the combined revenue proportion of automotive and edge businesses to 30% by 2028, forming a stable second growth curve and reducing reliance on the single data center business. In terms of technological upgrading, global energy conservation regulations are becoming increasingly stringent, and green computing has become an industrial rigid demand. High power consumption has become an obvious disadvantage for NVIDIA in market competition. Therefore, the company launches targeted product development, rolling out RTX Spark low-power chips for edge inference and energy-saving Green Blackwell chips for data centers. It also acquires low-power ASIC design startups to quickly make up for deficiencies in energy-saving technologies. The new low-power product lines not only meet the market demands of green data centers and lightweight edge inference, but also help NVIDIA enter new segmented markets restricted by energy consumption indicators. Overall, the WO strategy combination addresses the company's weaknesses from the perspectives of business structure and product technology, effectively dispersing operational risks brought by a single market and tapping incremental potential in line with industrial trends. It is expected that the company's overall gross profit margin will remain above 68% after implementation, achieving a balance between high growth and high profitability.

Priority 2: ST Strategies

1. Defensive strategy combined with horizontal integration (against political threats): The company needs to create region-specific chip products which will help them follow export restrictions while keeping their foreign market presence intact.
2. Defensive strategy combined with M&As and patent layout (against competitive and legal threats): The company will build stronger ecosystem protection through patent defense while using M&As to remove technological competition and they will handle anti-monopoly investigations and alternative chip market effects.

The company's core strength defense system depends on ST strategies which use CUDA ecosystem and patent accumulation to fight two primary external threats which include alternative technologies and worldwide anti-monopoly regulations. The performance of customized ASICs and TPUs continues to improve while RISC-V open-source architectures rapidly expand into edge markets which causes general-purpose GPUs to lose their market position. The European Union and United States have started anti-monopoly investigations against tech giants while their business operations and technology development face potential limitations from new regulatory rules. The two threats which affect NVIDIA create a dangerous situation which threatens to damage its leadership position in the long run. NVIDIA uses two strategies to fight against technological substitution threats by making their ecosystem accessible to everyone and by protecting their business through strategic acquisitions. The company has started to

open-source particular components from the CUDA system while making core mathematical libraries including cuBLAS and cuDNN available as source code to attract academic institutions together with small and medium-sized developers across the world which strengthens CUDA's position as an industrial standard and creates higher barriers for competitors who want to duplicate the system. The company establishes an annual special M&A budget which amounts to 3 billion US dollars for targeted acquisitions of new technology companies that work with RISC-V architectures and inference ASICs to stop competitors before they start and convert outside alternative technologies into company-owned technological assets. NVIDIA operates according to anti-monopoly regulations through its self-directed efforts to achieve regulatory compliance. The organization provides voluntary codes of conduct to regulatory authorities yet it only shares basic technical information about chip interconnection interfaces to solve market monopoly concerns which helps them obtain regulatory support. The strategic plan will eliminate at least three large-scale competitors who use alternative technologies by 2028 while decreasing the threat of anti-monopoly penalties by half and maintaining a yearly growth rate of more than 20% in global CUDA developers to build the software ecosystem as its principal strength.

Priority 3: WT Strategies

1. Risk diversification combined with market penetration: Small and medium-sized enterprises together with research institutions need to become operational risk diversifiers through their ongoing operational risk diversification activities which will help them counter the danger of depending on few customers because AI investment has slowed down.
2. Backward integration combined with defensive strategies and strategic alliances: The company needs to develop its secondary suppliers base while building a supply network that spans multiple sources to handle its current single supply chain vulnerability and protect against geopolitical dangers and insufficient production abilities.

The WT strategies serve as the base for all other strategic activities because they address the organization's internal problem of depending too much on one supplier and they defend against outside dangers which include geopolitical disputes and worldwide manufacturing limitations. The Fabless business model of NVIDIA depends on TSMC for its advanced packaging needs because HBM production requires SK Hynix and Samsung and Micron to control the entire market. The supply chain concentration creates potential risks which include disrupted supplies and rising costs and limited manufacturing abilities because of regional market conditions and semiconductor market patterns which block front-end product development and market growth. NVIDIA achieves supply chain problem solutions through full promotion of backward integration and multi-dimensional strategic alliances which they use to establish a supply network that spans multiple suppliers and multiple regions. The advanced packaging industry benefits from this development because it enables Samsung to build its packaging factory for mass production operations which will produce 25% of flagship chip packaging capacity. The company has established a backup arrangement with Intel to use its Foveros advanced packaging technology as an additional supply source which breaks TSMC's exclusive control over the market. NVIDIA plans to invest between 500 million and 1 billion US dollars into Micron to obtain first access to new HBM4e product manufacturing facilities which creates a three-way procurement system between SK Hynix, Samsung and Micron. The strategy operates to build stronger defenses for supply chain systems which serve as its main objective. The plan will reduce TSMC dependency risk coefficient from 0.82 to 0.55 while it will reduce HBM procurement cost variability between plus and minus 18 percent to plus and minus 8 percent by 2028. The WO and ST strategies need a stable and diversified supply chain because it offers production capacity and cost stability which enables them to run their operations steadily through time.

Resource Allocation and Implementation Schedule Planning

The strategic implementation process requires proper resource distribution together with scheduled execution to achieve its objectives. The entire process divides into three stages based on strategic priorities and implementation challenges while we establish resource allocation and stage-based objectives and essential measurement indicators for proper execution.

2026–2027: Strategy Transformation Launch Stage

WO strategies are the core focus, with 40% of total resources allocated. The company needs to perform two main activities which include expanding its automotive and edge AI business markets and building power-efficient product solutions. The main performance measurement depends on achieving a 40% compound annual growth rate for automotive and edge business revenue which will enable quick exploration of new market possibilities.

2027–2028: Competitive Moat Strengthening Stage

The resource distribution process has started to concentrate on ST strategies because it directs 30% of resources toward CUDA ecosystem optimization and technological M&As and compliance operations. The organization seeks to increase its global CUDA developer base until it reaches 6 million members while achieving five defensive merger and acquisition deals.

The supply chain optimization process under WT strategies requires an ongoing effort which receives a steady 20% resource allocation throughout the entire duration. The core indicator is to lower TSMC's share of packaging capacity to below 70% and gradually implement multi-source supply layout. The traditional SO strategies function as additional base structures which dedicate 10% of their resources to standard flagship AI chip development for keeping their schedule of new chip architecture releases every 18 months and defending their position in the high-end training market. The resource allocation system follows its established guidelines which determine essential tasks and allows organizations to modify their approach while achieving their present and future objectives. The system directs resources toward essential transformation initiatives while it assesses standard business operations together with protective measures and future technological development requirements to prevent organizations from depending too heavily on one strategy or wasting their resources.

Conclusions

Combining industrial environment, internal conditions, external opportunities and threats, NVIDIA should adopt a three-in-one combined strategy with WO strategies as the core, ST strategies as the defense line and WT strategies as the risk bottom line to realize all-round upgrading. First, drive strategic transformation via WO strategies to solve the core problems of single revenue structure and defective product competitiveness. Expand diversified scenarios such as autonomous driving, edge computing and medical industries through related diversification, and launch low-power product lines via product development to adapt to industrial trends and tap incremental markets. This helps NVIDIA get rid of path dependence on the data center business and build a multi-polar revenue system, which is the core path to realize the corporate vision of becoming an AI infrastructure operator. Second, build competitive moats via ST strategies to safeguard core competitive advantages. Leverage the dual strengths of the CUDA ecosystem and patent portfolio, and adopt the combined measures of ecosystem opening, defensive M&As and compliance operation to address technological substitution and anti-monopoly risks simultaneously. This continuously widens the gap with competitors and maintains the company's leading position in the industry. Third, consolidate the risk bottom line via WT strategies to ensure operational stability. Continuously promote backward integration of the supply chain and supply chain strategic alliances to build a multi-regional and multi-vendor supply system, mitigating supply chain risks brought by geopolitics, production capacity shortages and price fluctuations and providing solid support for all front-end business layouts. The three sets of strategies are coupled and coordinated dynamically. They comprehensively strengthen NVIDIA's core competitiveness in technology, ecosystem, supply chain and market, and promote its strategic transformation from a GPU hardware vendor to a global leader in full-stack AI computing infrastructure. If implemented as planned, NVIDIA will establish a long-term competitive pattern with diversified revenue structure, insurmountable technological moats and highly resilient supply chains by 2028, fully realizing its long-term development vision.

NVIDIA uses strategic decisions to follow a transformational path which shows worldwide Fabless semiconductor design businesses and AI computing power providers their path for advancement. The semiconductor industry operates as an oligopoly with intense market competition which forces businesses to develop related diversification strategies because their single-product single-market approach fails to handle market fluctuations and external forces. The business model of leading companies requires them to adopt related diversification because this approach enables them to defend against market pressures while they search for new expansion opportunities. The business strategy of chip enterprises depends on their software ecosystems and patent accumulation because these elements create their core long-term competitive advantages. The fundamental elements which create ecosystem barriers stand as unchangeable factors that businesses need to compete against. The fabless business model requires companies to develop multiple supply sources for their manufacturing needs because they depend on outside suppliers for their packaging operations and core component acquisition. Businesses need to create supply networks from multiple sources to decrease their exposure to operational threats which arise from depending on individual suppliers and political situations in different countries. The research uses industrial statistics and corporate information from 2026 without any deep analysis of sudden technological industry changes or unexpected major shifts in international policies or sudden political disputes between nations. The research needs to explore how organizations respond to black swan events through their strategic approaches. The future will see AI technology growth which will create more edge computing and terminal AI and industrial intelligence competition in the market. NVIDIA needs to keep its strategic flexibility while it updates its strategic priorities and resource distribution and builds on current strengths and searches for new development opportunities.

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