



NVIDIA's competitive strategies in the AI computing industry: An application of BCG Matrix and TOWS matrix

Dr. Lung-Tan Lu

Department of Management, Fo Guang University, Taiwan

DOI: <https://doi.org/10.66856/ijcmr.2026.12.2.12171>

Abstract

With the rapid development of Generative Artificial Intelligence (Generative AI), global demand for high-performance computing and AI computing power has continued to surge. Graphics Processing Units (GPUs) have become critical infrastructure driving the digital economy and industrial innovation. Leveraging technological innovations in GPUs and the construction of the CUDA software ecosystem, NVIDIA has secured a leading position in the global AI computing market. Adopting the case study method, literature analysis and strategic management tools, this paper conducts a systematic investigation into NVIDIA. By integrating competitiveness evaluation, the BCG Product Portfolio Matrix and the TOWS Matrix, it analyzes the company's competitive advantages, product portfolio allocation and future development strategies. The research reveals that NVIDIA's core competitive edges stem from the CUDA ecosystem, highly focused R&D capabilities, robust financial standing and in-depth partnerships for advanced process supply chains, which collectively form an inimitable competitive moat. Nevertheless, the company also faces multiple risks, including over-concentrated supply chains, restricted access to regional markets, excessive reliance on major customers and challenges from emerging competing technologies. The BCG Matrix analysis indicates that the data center business falls into the Star category, while the gaming business acts as a Cash Cow. The autonomous driving and edge computing businesses demonstrate strong growth potential as emerging segments. Furthermore, four strategic directions—growth, diversification, turnaround and defense—are proposed via the TOWS Matrix to address the rapidly evolving industrial landscape. The findings can serve as a reference for Fabless semiconductor enterprises in formulating competitive strategies, building ecosystems and managing risks, and also expand the application scope of strategic management theories in the AI chip industry.

Keywords: NVIDIA, competitive strategy, CUDA ecosystem, BCG Matrix, TOWS matrix, fabless, AI computing power

Introduction

The second decade of the 21st century brought Generative AI to achieve major technological progress which resulted in a massive increase of worldwide computer power needs for both general and specialized computing operations. The GPU hardware platform which supports AI model training and inference has become a vital competitive asset for countries during their worldwide digital economic development. The semiconductor industry functions as the fundamental base for AI industrial development because it shows four key structural elements during its current industrial evolution which includes fast-paced technological changes and major production operations for advanced manufacturing and detailed industrial work breakdown and rising global political elements. The Fabless chip design model operates without physical fabrication facilities because it separates the capital requirements for wafer manufacturing and packaging and testing operations. The system allows businesses to focus their resources on developing chip architecture and building software ecosystems and marketing their integrated solution delivery through its combination of low asset demand and versatile operation and dedicated resource management. Top global chip companies have established this model as their standard development method which they currently use. NVIDIA has established itself as the top worldwide Fabless semiconductor company which developed a new market for GPUs beyond their original purpose of graphics rendering. The construction of the Compute Unified Device Architecture (CUDA) software ecosystem brought about an

advanced partnership between GPU hardware systems and software platforms which resulted in the company securing an almost total control of the worldwide high-end AI training computing sector.

The worldwide AI computing chip industry reached a value of more than 100 billion US dollars during 2025 while maintaining an annual compound growth rate that exceeds 30% which makes it a rapidly expanding market. The worldwide high-end AI GPU industry shows an oligopolistic market because NVIDIA controls more than 85% of the worldwide market. The worldwide semiconductor industrial network operates through an all-encompassing restructuring system which depends on TSMC to produce its advanced process facilities while supply chains will continue their present movement toward regional and local operations. Multiple nations across the globe have implemented semiconductor regulations together with programs which support this industry sector. The United States has established strict export rules for advanced semiconductors which caused a major transformation in how semiconductor businesses operate their worldwide operations. The market now faces aggressive competition from AMD and Intel and HiSilicon who focus their attacks on NVIDIA through their cost-effective products and their complete industrial chain management and their operations based on local market presence. The worldwide cloud service market leaders AWS and Google and Microsoft have dedicated substantial resources to create specialized computing chips which include Application-Specific Integrated Circuits (ASICs)

and Tensor Processing Units (TPUs). Dedicated chips maintain their ability to provide cost advantages during inference operations which reduces the available market for general-purpose GPUs. The worldwide AI computing industry experiences fast expansion while facing strong market competition and major security threats and unpredictable operational conditions. NVIDIA operates in a complex industrial environment which forces the company to establish competitive strategies and product portfolio designs and risk management systems that will determine its market position and future growth potential while shaping worldwide AI computing market development and technological progress and supply chain evolution. The study focuses on NVIDIA to investigate strategic management methodologies which reveal how top technology companies in fast-moving markets build their product lines and manage their strategic risks.

The study adds new knowledge to strategic management tool deployment methods which organizations operating in semiconductor and AI computing industries use. Most current academic studies rely on fixed analysis through single instruments like SWOT and BCG Matrix which cannot handle the evolving operational complexity of high-tech businesses. The research study applies three analytical approaches which include quantitative competitiveness evaluation and BCG Matrix and TOWS Matrix to analyze Fabless semiconductor companies. The study expands strategic management theory applications because it integrates multiple analytical tools to study high-end chip production and AI computing sectors. The study develops a complete analytical system which unites status analysis with competitiveness assessment and product distribution assessment and environmental scanning and strategic execution evaluation. The study develops an analytical system which combines competitiveness evaluation through multiple dimensions with product life cycle examination and internal-external environmental alignment for high-tech companies. The system establishes better strategic analysis structures which combine logical frameworks with organized systems and it overcomes the research limitations which standard case studies present. The research study shows strategic management theories which Fabless companies use have spread their operational reach. The core of traditional semiconductor theories about Integrated Device Manufacturer (IDM) organizations exists because of their own development activities. Fabless companies maintain completely different asset structures from IDMs while they split their value chain operations and apply different competitive methods and distribute their resources. The research uses NVIDIA as its benchmark Fabless company to demonstrate how strategic theories should develop for asset-light organizations which focus on R&D and operate as technology-driven high-tech businesses. NVIDIA leads the worldwide AI computing market through its ecosystem creation strategy and its lightweight asset management system and its methods for distributing resources and handling finances and its built-in organizational dangers which serve as learning examples and danger signs for worldwide chip developers and AI system manufacturers. The research presents a complete overview of NVIDIA's triumphant hardware-software ecosystem development through CUDA and its Fabless operational model and its financial management system and

its resource allocation focus. The development philosophy of this system which focuses on hardware first and software empowerment and developer lock-in serves as a direct guide for domestic chip companies to create their own hardware-software ecosystems which will lead to technological progress and worldwide expansion. The paper conducts an in-depth assessment of NVIDIA's current weaknesses together with all possible threats which stem from their concentrated supply network and their restricted market entry in specific regions and their dependency on major customers. The world faces growing geopolitical tensions which force businesses to restructure their supply networks while even industry leaders encounter dangers to their daily business operations. The findings enable high-tech companies to develop risk management systems which will help them build various supplier networks and improve their product offerings and maintain their growth momentum through proper risk management.

The study employs three different research approaches which include literature analysis and case study and quantitative scoring methods. The research begins with literature analysis to organize all existing studies about strategic management and the semiconductor industry and AI computing and corporate competitive strategies from both domestic and international sources. The research employs case study method which analyzes NVIDIA through detailed examination of its corporate financial statements and official industrial documents and market statistics. The quantitative scoring method establishes ten fundamental competitive metrics which rating system from 1 to 10 for assessing NVIDIA against its main competitors through combined qualitative and quantitative evaluation. Three established strategic management tools serve as research tools for this study because they include a multi-dimensional competitiveness evaluation system which measures corporate strength through six managerial viewpoints and the BCG Matrix which classifies four main business divisions into separate quadrants to develop suitable product portfolio approaches and the TOWS Matrix which creates an active competitive strategy system through assessment of company strengths and weaknesses and available market opportunities and threats. This case study consists of six parts. The first chapter introduces the study through explanation of its research background and its importance and the methods used and the framework structure. The study in Chapter Two examines how NVIDIA operates while it studies the business competition in its industry and evaluates its performance from various angles. The research identifies two main corporate elements which include fundamental core strengths and fundamental structural weaknesses. The BCG Matrix serves as a tool to group four essential business units into different categories while I develop product portfolio strategies and recognize potential risks. The research team analyzes external market possibilities and danger elements and assesses its own core advantages and disadvantages to develop TOWS Matrix as an analytical framework. The research develops four dynamic strategy systems through TOWS framework which leads to specific implementation paths. The research presents its final results while it summarizes industrial effects and identifies study boundaries and suggests directions for upcoming research.

NVIDIA's Operational Status, Industrial Competition Pattern and Competitiveness Analysis

1. Corporate Profile and Operational Model

NVIDIA began its business activities in 1993 when Jensen Huang joined forces with Chris Malachowsky and Curtis Priem to establish the company which operates from its Santa Clara base in California. The company operates through four main business segments which focus on data center accelerated computing and gaming graphics processing and autonomous driving computing platforms and edge AI computing systems. NVIDIA organizes its development into three main periods which stem from its technological development strategy and strategic business direction:

1. Graphics Card Market Expansion Stage (1993–2006): The Company launched the GeForce series of discrete graphics cards and captured the global consumer graphics card market with superior graphics rendering performance, establishing a leading position in PC gaming hardware and accumulating initial capital and user groups.

2. CUDA Ecosystem Foundation Stage (2006–2016): NVIDIA invested heavily in developing the CUDA unified computing architecture, transforming GPUs from dedicated graphics processors into general-purpose parallel computing processors. The strategic layout created the fundamental technological base and software environment which allowed the company to start its AI track business.

NVIDIA introduced four GPU architectures during the AI computing market boom period which began in 2016 and continues until now. The company introduced new GPU architectures through Volta, Ampere, Hopper and Blackwell to establish a growing technological advantage over its competitors which resulted in its command of the worldwide market for high-performance AI training computers. NVIDIA operates through the asset-light Fabless business model which allows the company to generate high profits while maintaining quick technology development. The business model shows how the company concentrates on its most valuable knowledge-based activities which include designing chip architecture and creating CUDA software and delivering complete solutions through marketing efforts. All capital-intensive processes such as wafer manufacturing, advanced packaging and chip testing are outsourced.

TSMC operates as the single source of supply for NVIDIA's advanced-process chip manufacturing in their supplier network. The two parties have entered into strategic cooperation agreements which allow TSMC to dedicate its 3nm and 4nm production resources for NVIDIA needs and enable NVIDIA to secure long-term manufacturing capacity through its substantial advance payments. The manufacturing process of advanced packaging requires TSMC to use its CoWoS technology while SK Hynix and Samsung serve as the main suppliers for High-Bandwidth Memory (HBM) products. The Fabless business model produces two different effects which affect how NVIDIA operates. The company avoids paying substantial fixed expenses which arise from wafer fabrication facility development and maintenance and equipment replacement because it operates independently from these activities. The company has the ability to adjust its market position through

its production capabilities which remove any restrictions from market changes. The supply chain system creates major risks for the company because it shows extreme concentration which exposes the business to interruptions from production facility changes and technological limitations and political interference at manufacturing facilities.

NVIDIA achieved 130.5 billion US dollars in total revenue for its fiscal year 2025 according to its annual report which ends on January 31, 2025. The company maintains a gross profit margin which exceeds 71% and net profit margin which exceeds 50% to become one of the leading performers in the global semiconductor market. The Generative AI boom created an explosion in data center GPU demand which became the main factor driving this growth. NVIDIA operates through four strategic business units which include data center AI GPUs and consumer GeForce gaming graphics cards and DRIVE autonomous driving chips and Jetson edge computing modules. The company generates most of its revenue from data center AI chips because these products make up almost 90% of total sales revenue which drives most of the company's revenue expansion and profit generation. The gaming graphics card market maintains a large market presence but their percentage of total revenue continues to shrink. The autonomous driving and edge computing businesses exist in their early market development phase which produces minimal immediate financial returns but they will become the company's main expansion areas for future growth.

NVIDIA operates two separate global distribution networks which serve both its consumer base and its business customers. The consumer segment maintains strong alliances with leading motherboard and graphics card producers ASUS and MSI and Gigabyte to distribute GeForce products which reach players across the world and computer users. The enterprise segment has built enduring strategic alliances with three leading worldwide cloud service providers which include AWS and Microsoft Azure and Google Cloud to provide data center GPU-based computing services across the globe. The United States export regulations which control high-end semiconductor shipments prevent NVIDIA from selling its H100 and H200 and B200 AI GPUs in the advanced Chinese market of Mainland China. Although NVIDIA has launched downgraded compliant products including H800 and H20 for local sales, their performance is substantially reduced and market competitiveness is weak. The local computing chip market led by HiSilicon creates an unpredictable environment which threatens to disrupt NVIDIA's business performance throughout Chinese Mainland territory.

2. Competitive Pattern of the Global AI Computing Industry

Overall Characteristics of the Competitive Pattern

The worldwide market for high-end AI computing GPUs includes a leading company which faces competition from several other firms which include NVIDIA and AMD and Intel and HiSilicon as its main competitors. The four businesses operate through different business models and take distinct technological paths while they follow separate market approaches and competitive tactics which together establish the fundamental structure of industrial rivalry. The four businesses maintain distinct operational frameworks which they use to handle their operations and they follow different technological paths and their market strategies and

competitive approaches create the essential structure of industrial competition.

NVIDIA dominates the high-end AI training GPU market through its control of more than 85 percent market share which creates a classic oligopolistic market structure. The company established this pattern because it entered the market first with its technology and its established ecosystem while generating large-scale production advantages and strong industry network connections in AI computing. The main cloud service providers of the world have chosen to build their own specialized chips which include ASICs and TPUs through their substantial financial backing. The market shows a developing pattern which aims to decrease dependence on standard GPUs together with NVIDIA products while the general-purpose GPU market continues to shrink.

Comparative Analysis of Major Competitors

1. NVIDIA operates as the leading industry force through its exclusive adoption of the Fabless business approach. The system operates through its self-contained CUDA environment which receives first priority access to TSMC manufacturing facilities to serve the worldwide market for premium AI training systems. The company operates as the top GPU architecture developer in its sector while their CUDA environment forces developers to stay with their platform. The product availability remains constant so NVIDIA maintains complete command of its market pricing.
2. AMD operates as a Fabless company which designs complete CPU and GPU and FPGA solutions through its full-stack design approach. The company follows a strategy which competes based on cost and performance and supports the ROCm open-source platform. The mid-range AI inference market becomes AMD's target through Chiplet technology which helps them reduce production expenses while they enter the market at affordable prices.
3. Intel operates as a dominant IDM company which maintains its own wafer manufacturing facilities. The x86 ecosystem allows them to distribute computing products which serve both customized government and enterprise needs and standard consumer PC requirements. The Gaudi series chips from this company fight for market space against NVIDIA's data center GPU products. The company faces declining advanced process development and its wafer facilities experience rising depreciation costs which cause poor financial performance.
4. HiSilicon: A regional competitor. The company faces overseas technology restrictions which block their access to 3nm and 4nm advanced manufacturing processes thus their hardware performance falls behind world-class products. The company depends on Ascend chips together with CANN ecosystem to serve government and enterprise clients and local cloud data centers throughout the Chinese Mainland where it holds separate market advantages in different regions.

Competition in Segmented Tracks

The worldwide AI computing market operates under different competitive systems which affect how companies fight against each other in various market areas.

1. **High-end training market:** Customers in this market require the most advanced computing power together with complete system stability and full environmental system compatibility. NVIDIA maintains its position as the only market leader because no other company appears ready to challenge its position during the upcoming period.
2. **Mid-tier inference market:** High sensitivity to latency and costs. AMD, Intel and NVIDIA fight for market position through their cost performance which serves as their primary competitive advantage.
3. **Regional localized markets:** The local market presence of HiSilicon and other vendors maintains itself through export restrictions and geopolitical battles which focus on particular geographic areas.

The worldwide AI computing sector shows different market structures because of technological standards and market rules and political influences which create an oligopoly at the upper level and complete competition at the middle level and multiple regional markets.

3. Quantitative Scoring System for Ten Competitive Indicators

To perform an unbiased analysis of NVIDIA's market position the study uses ten essential competitive metrics which span six managerial areas including production and marketing and human resources and R&D and finance and information management. The scoring system uses numbers from one to ten to evaluate companies through horizontal analysis between NVIDIA and AMD and Intel and HiSilicon. All scoring data are sourced from public industrial reports, corporate annual reports, production capacity statistics and developer data to minimize subjective bias. The six dimensions and corresponding ten indicators are listed as follows:

1. The production management indicators consist of three elements which include manufacturing capability consistency and cost management practices and multiple supply network distribution methods.
2. The marketing management indicators consist of two elements which include software ecosystem completeness and global channel coverage.
3. The human resource management indicators consist of two elements which include the number of top chip architects and the systems for employee retention and motivation.
4. The R&D management indicator shows how much money the organization invests in research and development activities.
5. The financial management indicators include operating cash flow stability which measures the organization financial health.

The organization needs to use EDA resources together with market data to create decisions which show their current decision-making skills.

Indicator Scoring and Basis

The production capacity stability scores show NVIDIA at 9 while AMD received 7 and Intel achieved 8 but HiSilicon only scored 4. TSMC dedicates 42% of its advanced process capacity to fulfill NVIDIA's production demands through 2027. The production capacity of AMD receives minimal attention which leads to frequent delivery postponements during their busiest times. Intel uses its own manufacturing facilities to maintain operations but it faces challenges because its advanced manufacturing processes produce minimal workable products. The regulatory rules prevent HiSilicon from making use of sophisticated manufacturing technologies.

The software ecosystem completeness scores show NVIDIA at 10 while AMD received 7 and Intel achieved 6 but HiSilicon only scored 5. The CUDA ecosystem includes more than 5.5 million developers who work worldwide while 92% of large language models use CUDA as their development platform. The ROCm and oneAPI ecosystems attract fewer users than CANN which operates solely within China but fails to expand into global markets. The number of top chip architects for each company stands at NVIDIA (9), AMD (8), Intel (10), HiSilicon (8). Intel maintains the most extensive pool of technical expertise which stands as the largest global resource for fundamental technical knowledge. The staff at NVIDIA focus their professional skills on GPU development and AI computing technology. The technical teams at AMD and HiSilicon operate across all levels of technology but they do not possess as many top talents as Intel does.

The R&D investment intensity scores show NVIDIA at 9 while AMD received 8 and Intel achieved 7 but HiSilicon exceeded all others with a score of 10. The fiscal 2025 period showed NVIDIA spending 11.75 billion US dollars on R&D which made up 9% of their total revenue. The R&D department at HiSilicon operates with the highest level of capital allocation for research activities. Intel distributes its R&D budget across different business units which produces poor results when it comes to AI chip investment efficiency. The production cost control scores show NVIDIA at 6 while AMD received 8 and Intel achieved 5 but HiSilicon reached 7. The entire product line of high-end products from NVIDIA uses cutting-edge manufacturing processes which result in expensive production costs. AMD maintains its cost structure through Chiplet technology which operates as an efficient system. The production costs for Intel's IDM business model create significant depreciation expenses. The manufacturing process restrictions maintain HiSilicon's cost structure at its current level.

The global channel coverage scores show NVIDIA at 9 while AMD received 7 and Intel achieved 8 but HiSilicon only scored 4. NVIDIA operates its distribution network throughout all major international markets which have become standard. Intel has established itself as an experienced OEM system player through its long market presence. The channel network of AMD fails to reach enough customers because HiSilicon cannot enter the overseas market for premium products. The operating cash flow stability scores show NVIDIA at 10 while AMD received 8 and Intel achieved 4 but HiSilicon reached 7. The last four years have shown continuous growth in NVIDIA's cash flow which now exceeds 550 billion US dollars in free cash reserves. Intel continues to experience financial losses which have created intense cash flow difficulties during the

past few years. HiSilicon generates its operational cash flow through the management activities of its parent organization.

The diversified supply chain layout scores show NVIDIA at 5 while AMD received 8 and Intel achieved 9 but HiSilicon reached 6. TSMC stands as the only supplier for NVIDIA's high-end chips because the company operates with a supply chain that lacks any form of diversification. Intel operates its business through two different approaches which include using its own manufacturing facilities and working with outside foundry partners. AMD obtains its manufacturing needs through TSMC and Samsung facilities. The supply chain of HiSilicon needs to undergo a complete transformation because it exists in the present phase of restructuring. The talent retention and incentive systems scores show NVIDIA at 8 while AMD received 8 and Intel achieved 5 but HiSilicon reached 9. HiSilicon operates a complete equity compensation program which maintains employee departure rates below three percent. The equity incentive systems of NVIDIA and AMD have reached their point of maturity. Intel lost a big number of workers because the company kept making cuts to employee benefits while it repeatedly dismissed its workers. The EDA resources and market data decision-making scores show NVIDIA at 9 while AMD received 7 and Intel achieved 10 but HiSilicon reached 6. Intel has developed an entire EDA system through its own internal development process. The company maintains its market leadership through its superior resource availability and advanced data analysis tools. HiSilicon faces restrictions when it comes to obtaining complete sets of advanced EDA tools which also limits its market data access to domestic territory only.

Analysis of Scores in Six Managerial Dimensions

- 1. Production management (average score: 6.67):** The organization received its lowest scores in this particular area. The company faces three main challenges which include a supply chain that focuses too much on one area and expensive modern manufacturing techniques and a lack of production diversity which creates major threats to their supply network.
- 2. Marketing management (average score: 9.50):** The company's core competitive advantage. The CUDA ecosystem and global channels create an unbreakable competitive barrier which blocks any competitor from achieving success in the current market environment.
- 3. Human resource management (average score: 8.50):** The organization maintains enough high-end skilled personnel along with steady workforces which creates a strong foundation for their technological advancement.
- 3. R&D management (average score: 9):** The R&D resources have been focused mainly on the AI computing track which demonstrates superior technological transformation efficiency when compared to other competitors who follow different paths.
- 4. Financial management (average score: 10):** The company operates with a financial setup which includes strong profit margins and large cash reserves and minimal borrowing that gives them protection from market fluctuations and financial threats and enables them to take part in industrial mergers and acquisitions.

- 5. Information management (average score: 9):** The process of product development and market choices depends on two main systems which include complete EDA tools and global market data systems.

The weighted calculation of ten indicators shows that NVIDIA has achieved an overall competitiveness score of 8.70 which positions it as the leading company among four enterprises and makes it the top global AI computing industry leader.

4. NVIDIA's Competitive Strengths and Structural Weaknesses

Core Competitive Strengths

- 1. Exclusive software ecosystem moat:** The CUDA ecosystem has developed into a full tool-chain after twenty years of continuous development which includes programming languages and compilers and libraries and developer communities. The high migration cost for users switching from CUDA to other platforms creates strong developer lock-in effects, supporting NVIDIA to maintain a gross profit margin above 70% for a long time.
- 2. Top-tier financial strength:** The organization maintains free cash reserves above 550 billion US dollars together with an organized asset-to-liability ratio which allows them to establish permanent production facilities and continue their intensive research activities and perform industrial acquisitions and mergers while protecting their financial stability better than their industry competitors.
- 3. Highly focused talents and R&D:** A flat organizational structure ensures high decision-making efficiency. The organization directs every technical asset toward GPU and AI hardware-software collaboration to achieve constant technological progress which results in growing competitive advantages against market competitors.
- 4. Priority access to advanced production capacity:** The Company achieves first priority for TSMC's 3nm and 4nm manufacturing operations together with CoWoS packaging facilities through its practice of establishing permanent manufacturing contracts and making upfront payments which maintain product flow during worldwide manufacturing shortages.

Structural Competitive Weaknesses

- 1. Severe supply chain concentration risks:** TSMC stands as the exclusive manufacturer of advanced packaging and high-end chip production because no other foundries meet the required standards. The combination of price increases and production level changes and international political developments at manufacturing facilities creates the highest operational risk for NVIDIA.
- 2. Loss of key regional markets:** The export controls prevent the company's main products from reaching the upscale market which exists in Chinese Mainland. The core growth market stands at risk because local vendors are increasing their efforts to replace products from their home region.

- 3. Eroding market share in mid-tier segments:** AMD expands its market presence in AI inference through its utilization of open-source platforms and its affordable technology solutions. The company faces challenges when it comes to competing with other businesses through their pricing strategies.

- 4. Limited cost control flexibility:** The most advanced manufacturing processes together with expensive equipment need to be used for long periods while HBM prices and advanced packaging costs continue to rise which keeps product costs at a high level. The business will experience growing negative effects when customers start to select products based on their price-to-performance ratio.

Analysis of NVIDIA's Product Portfolio Based on the BCG Matrix

The financial information from fiscal 2025 shows that NVIDIA operates four strategic business units, in which generate different revenue amounts and percentages of total company revenue. The data center business generated revenue of 115.2 billion US dollars, accounting for 88.2% of total revenue; the gaming business recorded 11.4 billion US dollars (8.7%); professional visualization business reached 1.82 billion US dollars (1.4%); automotive and edge computing businesses achieved 2.06 billion US dollars (1.7%). The company operates its business activities through three additional units which generate under twelve percent of total revenue thus establishing its position as a dominant single business operation. The BCG Matrix adopts market growth rate and relative market share as two core dimensions, dividing businesses into four categories: Stars, Cash Cows, Question Marks and Dogs. The different quadrants need separate resource distribution and business growth plans. The research establishes 10% as the essential market growth rate and 1.0 as the minimum relative market share requirement.

1. Star Business: Data Center AI GPUs (Blackwell/Hopper Architecture)

The worldwide market for high-end AI training GPUs will experience an annual growth rate of 31.7% between 2023 and 2025 which exceeds the standard growth benchmark of 10%. NVIDIA dominates the market with 94% share while AMD controls 6% which creates a market share ratio of about 15.67 that exceeds the 1.0 threshold. The business operates as a Star according to its classification. The company maintains its core competitive edge through its exclusive control of the CUDA platform system and its unbroken track record of chip design excellence and its secured partnership with elite production facilities which results in constant product shortages.

Strategies: The business needs to allocate all its top-tier R&D resources and production capacity and marketing resources to this particular business unit.

The company needs to sustain its current speed of technological development while making continuous improvements to its future architectural research programs. The company needs to establish extended production capacity agreements which will support their supply needs for upcoming years. The company needs to expand its collaboration with top cloud clients because this partnership

will maintain their market leadership position while enabling their Star business to generate more cash flow.

2. Cash Cow Business: GeForce Consumer Gaming Discrete Graphics Cards

The worldwide PC discrete graphics card market will grow at an average annual rate of 4.8% between 2023 and 2025 which falls below the 10% benchmark. The market shares of NVIDIA and AMD stand at 79% and 19% respectively which creates a relative market share of 4.16 that exceeds the 1.0 benchmark. This is a classic Cash Cow business. The gaming graphics card market functions as NVIDIA's essential business which produces regular revenue through its established market although it experiences minimal growth while generating enough income to support its other business divisions.

Strategies: The product line needs optimization because the company should decrease its funding for basic products while it should concentrate on producing profitable mid-to-high-end models.

The company should maintain its product value through its unique technologies which include ray tracing and DLSS to prevent its products from entering low-cost market battles. The organization needs to maintain its cost structure and inventory levels at maximum levels because these factors will produce the highest possible cash flow. The business should surrender its position in the low-end market to concentrate on achieving maximum total profits.

3. Question Mark Business: DRIVE Autonomous Driving Chips; Jetson Edge Computing Modules

The global automotive computing chip market will experience a 27.3% average annual growth rate between 2023 and 2025 which exceeds the 10% threshold. Mobileye controls the market with 36% market dominance yet NVIDIA holds 12.8% which produces a market share ratio of about 0.36 (below 1.0). This segment is classified as Question Mark. NVIDIA operates in a market with extensive potential but faces multiple obstacles because of extended vehicle certification times and customer demands for personalized solutions and multiple competitors and their struggle to generate quick profits.

Strategies

1. The company should target leading new energy vehicle manufacturers instead of working with various small customers.
2. The CUDA ecosystem requires development to support automotive applications through the creation of unique solutions.
3. The organization needs to establish particular performance evaluation checkpoints which will assess investment worth through unceasing evaluation.
4. Organizations need to stay patient during their strategic efforts while they develop fresh business opportunities which will generate lasting growth.

4. Dog Business: Obsolete Quadro Professional Graphics Cards ; Legacy Embedded Chips

The market for these products sees an average annual growth rate of merely 2.1%, indicating stagnant development. The market distribution shows that competitors control 61% of the market base yet NVIDIA

holds 22% which creates a market share ratio of about 0.36 (below 1.0). This business operates as a Dog. The products maintain their customer base through long-standing relationships while their technological components have become obsolete and their total profit from sales has decreased. The business continues to spend its corporate funds without generating successful outcomes.

Strategies

1. Terminate technological iteration for legacy products and only retain basic maintenance services.
2. The company needs to reduce its production ability while using marketing campaigns to eliminate its current stock of products.
3. The organization needs to move its available human resources and production capacity and capital assets to support business units which include Star and Question Mark businesses.
4. The company should maintain its high-value niche market segments which include premium film and television rendering and Omniverse supporting services.

5. Overall Evaluation and Risk Identification of the BCG Product Portfolio

NVIDIA has developed an effective product lineup which consists of Stars that drive business expansion and Cash Cows that generate financial resources and Question Marks which hold untapped potential and Dogs that get removed through planned resource distribution following the main principles of the BCG Matrix. Resources are highly concentrated on the high-growth and high-margin data center business to avoid resource dispersion. The gaming operations generate stable financial returns which enable the company to develop new businesses while growing its existing core business activities. The overall portfolio is among the healthiest in the industry. The main hidden danger stems from the company's dependency on its sole business operation which generates about 90% of total revenue through its data center business. The company depends entirely on AI computing market success because its business depends on this market for almost all its revenue. The company faces a threat to its expansion because the Star business might lose its growth potential when AI market growth slows and competitors enter the industry. The company needs to speed up its business incubation process for autonomous driving and edge computing and other new businesses because it wants to develop multiple growth paths which will help it decrease its dependence on one main business.

Analysis of NVIDIA's Internal and External Environment (Foundation for SWOT)

This chapter organizes all external opportunities and threats together with internal strengths and weaknesses which serve as the base for developing the TOWS dynamic strategy in the next section.

1. External Opportunities (O)

1. Economic opportunities: The worldwide AI infrastructure development has begun a permanent period of major financial commitments which will surpass 3.8 trillion US dollars by 2030. AI servers and computing accelerators stand as the primary procurement items which companies need to acquire.

The main worldwide cloud providers show a steady annual increase of 35% in their AI spending which creates strong market requirements for top-tier graphics processing units. The Middle East and Southeast Asia and India have started building their own computing facilities which enables them to develop additional market opportunities. The market requires industrial GPUs because Industry 4.0 and digital twin's technology systems help control industrial market trends. The company maintains a strong credit rating which allows them to obtain affordable funding for their business expansion through mergers and acquisitions and capacity building.

2. **Political opportunities:** The U.S. CHIPS and Science Act and the EU Chips Act provide R&D subsidies and tax incentives for semiconductor enterprises, from which NVIDIA, as a leading U.S. local firm, benefits directly. The European nations together with American states have added computing strength to their defense systems so they now use domestic suppliers for all government and military and defense acquisition needs which results in continuous procurement contracts. The semiconductor policies which India and Vietnam and the Middle East and other regions have established allow NVIDIA to select foreign locations for its operations while it expands its market presence.
3. **Technological opportunities:** The continuous expansion of large model parameters drives computing demand to double every 18 months, and NVIDIA's architectures perfectly match the requirements for training ultra-large models. The commercialization of advanced packaging and storage technologies including HBM4, CoWoS and CPO helps continuously upgrade product performance. The expansion of L3-L4 autonomous driving systems leads to a growing market for on-board automotive computing systems. The development of AI PCs and VR/AR and AIGC terminals creates fresh opportunities for users to access computing devices. The industrial environment receives its integrated hardware and software solutions through the implementation of Omniverse digital twin technology.
4. **Social and demographic opportunities:** Labor shortages in developed economies force manufacturing automation upgrading and drive demand for edge computing. The expanding middle class along with increasing young population in developing nations creates rising demand for esports and consumer AIGC hardware products. The user base of the CUDA ecosystem keeps growing because small businesses and individual developers continue to adopt artificial intelligence applications.
5. **Environmental and legal opportunities:** The implementation of global green data center policies gives procurement priority to high-energy-efficiency products. The new generation of GPUs from NVIDIA offers high performance and energy efficiency which can substitute for power-hungry equipment from the past. The global increase in intellectual property and data security regulations creates stronger legal safeguards for the CUDA ecosystem while making it

more difficult for competitors to develop similar systems.

2. External Threats (T)

1. The United States has implemented growing export restrictions which prevent advanced chip sales to China so the country lost access to its complete domestic market. The Chinese Mainland computer industry developed into a self-contained system because of its export controls which now prevent any foreign companies from entering the market. The semiconductor industry across the world has started to break down into separate regional markets. The current business environment requires multinational corporations to encounter rising expenses for regulatory adherence together with enhanced entry barriers which local organizations in various countries now support their domestic businesses.
2. The growing development of open-source ecosystems including AMD's ROCm system has started to break down the dominant power which CUDA used to hold. Major cloud providers now create their own custom ASICs and TPUs which operate at high capacity levels to substitute general-purpose GPUs for inference operations. The ARM-based server chip adoption has started to remove the need for general-purpose GPUs which allows different technology paths to develop within the industry.
3. Economic threats The AI industry faces asset bubble risks. Cloud providers will reduce their capital spending when business performance does not meet expectations which will cause GPU purchase numbers to drop. The organization depends too much on its main customers because these clients have started producing their own chips which threatens to decrease their purchasing activities. The industry faces growing inventory risks because of long-term wafer procurement contracts which cannot be terminated during market downturns. The semiconductor industry operates under cyclical patterns which generate increasing business difficulties for its operational systems.
4. Legal threats The EU together with the United States and United Kingdom and multiple other regions have started investigations against NVIDIA because of its dominant market position and its practice of bundling CUDA with its products. The court will order the company to pay large fines while it needs to reveal its technology and must follow restrictions which affect its business operations. The process of bringing new products to market takes longer because of worldwide access and safety evaluation requirements for electronic devices which also drive up operational expenses.
5. The deployment of worldwide carbon taxes together with data center energy limits and wafer production emission standards creates operational difficulties for power-intensive high-end GPU models. The ongoing environmental cleanup work at TSMC along with their rising prices create higher manufacturing expenses for NVIDIA which results in reduced profit percentages.

3. Internal Strengths (S)

1. **Operation and supply chain strengths** The Fabless asset-light model delivers strong financial flexibility. The business has secured long-term contracts which allow them to receive primary access to TSMC's advanced manufacturing operations and SK Hynix's HBM packaging facilities which maintain their essential hardware supply.
2. **The CUDA ecosystem** operates with a worldwide developer network which includes over 5.5 million programmers who maintain strong market entry restrictions. The organization operates a worldwide channel network which enables them to serve both business and individual customers across every market segment.
3. **Organizational and talent strengths** The organization operates with a flat structure which enables fast decision-making processes. The company offers high salaries together with equity incentives which help them attract top-performing international professionals. The industrial sector achieves its full-stack talent development through mergers and acquisitions which solve its technical problems with high-speed interconnection.
4. **R&D strengths** Full-stack independent R&D capabilities for GPUs, CPUs and DPUs. The industry leads the way in chip architecture development because companies which enter first to develop on-board computing and digital twin's technology gain permanent industry control.
5. **Financial strengths** The company maintains exceptionally high gross profit margins together with large free cash reserves and minimal debt which creates strong protection against market fluctuations and business threats and allows them to actively pursue industrial mergers and acquisitions.
6. **Data management strengths** A closed-loop management system for global client demand data drives product iteration based on market feedback, lowering risks in inventory and product definition to a level far below industry peers.

4. Internal Weaknesses (W)

1. **Supply chain weaknesses:** The entire supply chain depends on TSMC for producing high-end wafers and advanced packaging solutions while HBM production requires overseas vendor support. The business faces substantial risks because it does not have its own modern manufacturing facilities which leads to potential supply disruptions and price increases.
2. **Market structure weaknesses:** The business lost all its high-end market presence in Chinese Mainland while its mid-tier market share continues to decline. The company depends too much on its main customers which creates unstable performance results.
3. **Organizational and human resource weaknesses:** Competitors continue to poach our staff which creates an urgent need to protect our employees from leaving.

The company expanded quickly which caused its organization to grow too large while communication became more expensive and decision processes grew longer.

4. **R&D risks:** The R&D investment for a single chip architecture exceeds 10 billion US dollars, resulting in huge sunk costs. The GPU technological path depends too much on current systems which could lead to sudden changes in technology. The CUDA ecosystem requires more money each year to maintain its operational systems.
5. **Financial and valuation weaknesses:** The business holds an above-average market valuation for an extended period but any reduction in its business growth rate will cause its stock price to drop drastically. The company faces possible asset value reduction because of its long-term foundry contracts but its new business operations continue to generate losses which decrease total business profitability.
6. **Data and compliance weaknesses:** The separation of market data from Chinese Mainland creates problems when researchers and decision-makers study regional strategies. The global anti-monopoly surveillance system for CUDA technology produces two developing issues which drive up both compliance expenses and regulatory risks.

NVIDIA's Dynamic Competitive Strategy System Based on the TOWS Matrix

Built on the SWOT framework, the TOWS Matrix matches internal resources with external environments to formulate four types of strategies: SO (Growth), ST (Diversification), WO (Turnaround) and WT (Defense), realizing dynamic adaptation to the external environment.

1. SO Growth Strategy (Strengths + Opportunities)

The organization needs to apply its technological strengths and financial resources and production abilities and ecosystem capabilities to capture market expansion opportunities from worldwide AI infrastructure development and autonomous vehicle systems and new market entries which will lead to business expansion and market dominance.

1. **Full-stack technology and ecosystem expansion:** The Company must continue its development of main GPU products to fulfill the needs of national computing infrastructure initiatives which operate across different countries. The company needs to develop its DRIVE on-board chip business while building relationships with top vehicle manufacturers to access the autonomous driving market. The company should start selling RTX Spark chips to establish its market position in the AI PC industry. The CUDA toolchain needs optimization together with developer community growth to establish stronger network effects.
2. **Capital-driven and policy-supported expansion:** The organization needs to submit applications for semiconductor supportive policies across different nations to obtain financial support through subsidies and tax breaks. The organization needs to create R&D

facilities and establish operational bases across Europe and India and the Middle East to enhance its international business reach. The company needs to perform strategic mergers and acquisitions which will target edge computing and optical interconnection sectors. The company needs to build new customer relationships with regional cloud providers and research institutions and small and medium-sized businesses to create a better client portfolio.

2. ST Diversification Strategy (Strengths + Threats)

The organization needs to use its internal capabilities to handle external threats which include geopolitical controls and technological substitution and anti-monopoly supervision while it should spread its operations through diversification to reduce risks.

1. Customized products to circumvent geopolitical controls:

The Company needs to keep producing reduced-functionality products which meet standards to stay active in the middle market segment of Chinese Mainland. The local enterprises need to work together with us for creating special inference chips which would let us continue our operations despite the imposed technical limitations. The company needs to establish a product hierarchy system which will enable them to release various product lines while following regional compliance standards.

2. Dual diversification of business and supply chain:

The system needs to support various computing applications which include industrial operations and medical services and digital twin technology to decrease its dependency on cloud-based GPU processing. The company needs to build technical links with Samsung and Intel Foundry Operations to create alternative foundry suppliers which will reduce its complete dependence on TSMC.

3. WO Turnaround Strategy (Weaknesses + Opportunities)

Strategic thinking: The organization should use outside industrial possibilities to solve its present problems which include concentrated supply networks and operating only one business unit.

1. Diversify business structure:

The Company needs to expand its business portfolio by taking advantage of autonomous driving and edge AI market growth while DRIVING and Jetson operations need additional funding to build their third and fourth expansion paths. The organization should decrease its dependence on data center operations through systematic reduction processes.

2. Optimize technological architecture to improve energy efficiency:

The organization needs to follow the green data center movement while it develops energy-efficient chip designs which generate better computing power through reduced electrical usage. The organization needs to fulfill worldwide energy saving requirements while reducing carbon emissions because this approach will open up new business prospects.

4. WT Defense Strategy (Weaknesses + Threats)

Strategic thinking: The Company should defend itself through defensive measures because its present internal weaknesses align with external threats which exist in the market. The company should protect its operational funds while maintaining full control over all risk factors which threaten its business operations.

1. Market expansion and client diversification:

The Company should enhance its presence throughout Southeast Asia as well as Latin America and Africa which are new markets in development. The company needs to build its small and medium-sized business customer base together with research institute clients and regional cloud users to decrease its dependence on major clients and protect itself from potential funding cuts because of self-made chip production.

2. Dynamic management of supply chain and inventory:

The Company needs to speed up its development of different supplier partnerships because this allows them to shift their production operations across various regions. The business needs to establish flexible systems which will determine its future wafer procurement contract amounts while following strict inventory management rules to protect itself from financial losses during market slumps.

The four types of strategies operate as a complete system which includes SO strategies that work to achieve new growth while building on existing strengths and ST strategies which use offensive defense to protect against outside dangers and WO strategies that use outside chances to fix inside flaws and WT strategies which apply defensive tactics to protect operational stability. The four strategies at NVIDIA need constant resource distribution changes together with implementation order modifications because of their unstable industry environment and their need to handle multiple external market changes.

Conclusions

NVIDIA holds the top position as the leading company in worldwide AI computing market competition. The company maintains four fundamental competitive advantages through its CUDA system and worldwide distribution network and financial stability and its ability to attract exceptional professional staff. The organization faces three major structural problems which include its supply chain that depends heavily on few suppliers and its failure to maintain essential market positions and its weak position against competitors in the average market segment. The organization shows excellent core capabilities together with major organizational challenges. NVIDIA's product lineup exists as a complete strategic tier which contains Stars and Cash Cows and Question Marks and Dogs. The company faces growth risks because its data center business produces most of its revenue. The outside environment establishes various chances for success yet it also establishes multiple dangerous obstacles. The construction of AI infrastructure and development of autonomous driving and emerging market growth provide chances for sustained business expansion but external factors including geopolitical rules and technological shifts and anti-monopoly monitoring and industrial market patterns create rising business uncertainties. The TOWS Matrix serves as NVIDIA's

fundamental method for managing their complex operational environment through its four-dimensional dynamic strategy system. The four strategies base their operations on specific roles which work together to establish a complete system for offense and defense. NVIDIA achieves its core business success through a unified business approach which combines hardware production with software development and ecosystem management. The hardware-software integrated ecosystem creates stronger sustainability barriers than traditional chip companies which focus on hardware specifications for their competition.

NVIDIA leads the global AI computing market as the number one company in worldwide competition. The organization maintains four primary competitive strengths through its CUDA system and international distribution network and financial stability and its capacity to draw in top-notch professional personnel. The organization faces three major structural problems which include its supply chain that depends heavily on few suppliers and its failure to maintain essential market positions and its weak position against competitors in the average market segment. The organization demonstrates strong fundamental abilities although it encounters major difficulties which affect its entire organizational structure. NVIDIA's product offerings form a full strategic level which includes Stars and Cash Cows and Question Marks and Dogs. The company faces growth risks because its data center business produces most of its revenue. The external environment creates various opportunities for achievement but it also creates multiple dangerous barriers which threaten success. The construction of AI infrastructure and development of autonomous driving and emerging market growth provide chances for sustained business expansion but external factors including geopolitical rules and technological shifts and anti-monopoly monitoring and industrial market patterns create rising business uncertainties. The TOWS Matrix serves as NVIDIA's fundamental method for managing their complex operational environment through its four-dimensional dynamic strategy system. The four strategies base their operations on specific roles which work together to establish a complete system for offense and defense. NVIDIA reaches its primary business achievements by uniting its business operations which include hardware manufacturing and software creation and ecosystem oversight. The hardware-software integrated ecosystem creates stronger sustainability barriers than traditional chip companies which focus on hardware specifications for their competition.

All data in this research are sourced from public corporate annual reports, authoritative industrial reports and academic literature. The organization restricts access to vital confidential data which includes their core R&D information and their complete supply chain agreements and their operational management records. The risk evaluation process together with strategic recommendations emerges through logical deduction which remains unconfirmed by internal organizational data. The research method establishes its focus on total enterprise operations instead of detailed analysis of individual product segments and separate market areas which results in restricted research detail. The worldwide AI computing sector will experience a fresh development phase between 2023 and 2027 which will feature reduced expansion rates and stronger market battles and multiple technological approaches and divided market segments. Three essential elements will determine NVIDIA's position in the future industry: their ability to

expand their supply chain network and their success in launching secondary growth curves which include autonomous driving and edge computing and their full strength to solve problems which emerge from open-source systems and their own chip development and their compliance with anti-monopoly regulations. Future studies should examine how NVIDIA's strategic initiatives perform after their implementation while researchers should investigate the differences between Chinese and foreign computing chip companies and track the competitive development patterns which AI computing industry will establish over extended time periods.

References

1. Adner R. Ecosystem as structure: An actionable construct for strategy. *Journal of Management*,2017;43(1):39–58. <https://doi.org/10.1177/0149206316678451>
2. Barney JB. Firm resources and sustained competitive advantage. *Journal of Management*,1991;17(1):99–120. <https://doi.org/10.1177/014920639101700108>
3. Gartner. Forecast analysis: Semiconductors, worldwide. Gartner Inc, 2025.
4. Grant RM. *Contemporary strategy analysis* (10th ed.). Wiley, 2021.
5. NVIDIA Corporation. Annual report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 for fiscal year 2025. NVIDIA Corporation, 2025.
6. NVIDIA. Annual report 2025: Fiscal year ended January 31, 2025. NVIDIA Corporation, 2025.
7. OpenAI. ChatGPT (Mar 14 version) [Large language model]. OpenAI, 2023. <https://chat.openai.com/chat>
8. Porter ME. *Competitive strategy: Techniques for analyzing industries*. Free Press, 1980.
9. Porter ME. *Competitive advantage: Creating and sustaining superior performance*. Free Press, 1985.
10. Wehrich H. The TOWS matrix: A tool for situational analysis. *Long Range Planning*,1982;15(2):54–66. [https://doi.org/10.1016/0024-6301\(82\)90120-0](https://doi.org/10.1016/0024-6301(82)90120-0)