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Comparative analysis of AI innovation systems in the U.S. and South Korea

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Abstract

The rapid advancement of artificial intelligence (AI) significantly impacts the global landscape, making it essential for both technological and economic growth. Understanding the strategies countries use to support AI research is key to grasping innovation trends. The United States (U.S.) and South Korea are major players in this field, each developing a research ecosystem shaped by their unique economic and social backgrounds. This study explores AI research in these countries, focusing on research areas, government support, industry involvement, and talent development. By comparing these aspects, the analysis aims to highlight the distinct features of AI research in the U.S. and South Korea, as well as their roles in the global AI movement. Both nations approach AI development in different but complementary ways. The U.S. leads in innovation and talent cultivation, due to its prestigious academic institutions, corporate investments, and focus on fundamental research and key applications. While the U.S. government plays a crucial role in funding, there is growing attention to the social and ethical implications of technology, including efforts to expand access to AI. Meanwhile, South Korea adopts a government-led approach, concentrating on AI hardware and proprietary models while leveraging its semiconductor industry. South Korea aims to become a responsible global leader in AI by prioritizing ethical practices and building trust. Significant government investments, research facilities, and international cooperation demonstrate its commitment to becoming a leading AI hub, despite challenges in fulfilling the demand for specialized expertise.

Keywords: artificial intelligence (AI), comparative case study design, national innovation systems framework, AI innovation systems, U.S., South Korea

Introduction

The rapid development of artificial intelligence (AI) has significantly impacted on the global landscape, making it a crucial part of future technological and economic growth. It is essential to comprehend the various strategies countries employ to advance their AI research and development in order to understand the direction of global innovation fully. The United States (U.S.) and South Korea play key roles in shaping the AI field, each creating a unique research environment that reflects their specific economic, government, and social contexts. This study provides a comprehensive examination of AI innovation systems in these two countries, focusing on their research objectives, government support levels, industry involvement, and talent development strategies. By comparing these key elements, this analysis aims to highlight the distinctive features of AI research in the United States and South Korea, as well as their contributions to the evolving global AI revolution. The United States has established itself as a leading authority in artificial intelligence (AI) research, thanks to its top academic institutions, a vibrant culture of innovation, and

substantial financial investment from the private sector. In this environment, numerous technology giants, including Google, Microsoft, Amazon, Alphabet, Meta, Apple, and OpenAI, are driving AI advancements to new heights. Additionally, federal agencies such as the National Science Foundation (NSF) and the Defense Advanced Research Projects Agency (DARPA) provide vital funding and strategic support, helping the United States maintain its leading position in AI research and development (R&D). In contrast, South Korea, despite its smaller size, has made significant investments in artificial intelligence, establishing itself as a leading country in this field. Known for its strong infrastructure, South Korea has been advancing its AI-focused research efforts through collaborations between the government and private companies. Major firms, such as Samsung, LG, and Naver, support a vibrant AI research ecosystem, all of which is backed by the government's commitment to an AI-centered policy framework. Through innovative initiatives, such as the "Korean New Deal," South Korea aims to enhance its position in the global AI landscape, with a focus on manufacturing, healthcare, and smart cities.

Research Questions and Objectives

This study aims to thoroughly examine the Artificial Intelligence (AI) research landscape in the United States and South Korea, focusing on the key question: How do the National Innovation Systems of the U.S. and South Korea influence their unique approaches to AI research, development, and global impact? This broad question seeks to understand how the different AI research ecosystems and strategies of these two countries contribute to and influence the international AI community, considering their respective strengths in innovation, talent development, hardware, and ethical AI practices.

By analyzing these two influential yet distinct AI players, the study aims to identify similarities and differences within their AI innovation environments, providing valuable insights into various paths of technological progress and exploring each country's approaches to AI development within their specific economic and social contexts. To achieve this broad goal, the study has several specific objectives. It aims to identify and analyze key differences in research fields, government support, industry participation, and talent development that shape the AI research ecosystems in the United States and South Korea. Additionally, the research seeks to explore how the U.S.'s focus on foundational research and corporate investment, along with South Korea's government-led strategy and semiconductor leadership, contribute either in a complementary or competitive way to global AI progress.

The study will also examine and compare industry roles and involvement in AI research and development, as well as evaluate talent development strategies within the AI sectors of both countries. Next, the study will compare the differences in ethical and regulatory approaches and strategies for expanding AI access between the U.S. and South Korea and examine the effects these differences have on their respective AI research trajectories. Through this detailed comparison, the paper aims to clarify the unique aspects of AI research in each country, understand their contributions to the global AI landscape, and specifically examine how both the U.S. and South Korea approach AI development, including their focus on foundational research, key applications, corporate investment, ethical concerns, government strategies, hardware priorities, and building trust. Finally, the study suggests future directions for AI research and development through international collaboration.

Research Methodology and Data Management

This study uses Comparative Case Study Design to explore AI development in two countries, focusing on unique features, trends, and factors. It relies on the National Innovation Systems (NIS) framework, which

sees innovation as a dynamic process driven by interactions among a country's institutions, organizations, and policies. It highlights how networks of actors shape AI innovation strategies.

Research Design

The chosen methodology is a Comparative Case Study Design, focusing on the United States and South Korea as primary examples. This approach is particularly helpful for exploring complex, context-specific phenomena, as it provides a detailed and nuanced understanding of each country's unique situation. It helps identify both common patterns and individual characteristics within their AI innovation ecosystems. By analyzing these two leading, globally influential AI players, the study seeks to reveal different developmental paths in AI technology (Bartlett & Vavrus, 2017). This approach aligns with Charles Tilly's (1984) concept of Individualizing Comparison, which emphasizes contrasting a few cases to highlight their distinct traits.

Theoretical Framework - National Innovation Systems (NIS)

The National Innovation Systems (NIS) framework serves as the primary theoretical guide for this study. Its core idea views innovation as a complex, interactive process mainly shaped by the institutions, organizations, and policies within a country. It highlights the connections and exchanges of knowledge, technology, and resources among various actors, such as firms, universities, government agencies, and research institutions. In this study, the NIS framework will be used to analyze each nation's AI development by breaking it down into its key systemic components. This approach allows for a structured comparison of their strengths, weaknesses, and strategic priorities, moving beyond simple attribute listing to explore the complex relationships and dynamics that produce unique national outcomes in AI (Nelson, 1993).

Data Collection Strategy

To ensure a thorough understanding, the study will employ a mixed-methods approach, collecting both qualitative and quantitative data. The focus will primarily be on recent developments over the past 5-10 years (e.g., since 2015) to reflect the rapid growth and increasing importance of AI. Relevant historical context will be incorporated as needed to clarify current trends and strategic choices, such as South Korea's government-led development model. The study will utilize a diverse range of data sources and are listed below:

- **Policy documents**, including government white papers, national AI strategies, budget reports, and relevant legislative acts from the U.S. and South Korea (such as U.S. AI initiatives and South Korea's "AI National Strategy"), will be carefully analyzed.
- **Academic literature**—comprising scholarly articles, research reports, and books on AI development in both nations, as well as broader studies on innovation and comparative political economy—will provide key insights.
- **Industry reports**, covering market analysis, investment figures, corporate R&D expenditures, and patent filings from reputable sources such as IDC, Gartner, and industry associations, will provide valuable industry perspectives.
- **Official government statistics** on R&D investments, STEM talent pipelines, and workforce demographics will provide quantitative data.
- **News articles and, where possible, expert interviews** with AI researchers, policymakers, and industry leaders will be reviewed to capture current trends and nuanced viewpoints.

Finally, university research outputs—such as data on AI-related publications, citations, and university-industry collaborations—will be analyzed.

Data Analysis Strategy

The data collected will be carefully cross-checked by systematically comparing each element within the U.S. and South Korea's National Innovation Systems framework to identify similarities, differences, and

unique characteristics. The analysis will follow several key steps. Pattern recognition will help identify recurring themes, potential causal relationships, and underlying factors that explain differences in AI development paths between the two countries. For qualitative data such as policy documents and interview transcripts, thematic analysis will be used to identify and thoroughly explore key themes and narratives related to AI strategy, government support, industry involvement, and talent development.

When relevant data is available, quantitative methods, including descriptive and comparative analysis, will be applied, utilizing metrics like R&D spending, AI patent counts, and publication numbers to highlight differences in scale and focus. Finally, insights from both qualitative and quantitative data will be combined to create a comprehensive overview of each country's AI National Innovation System. This integration is essential for explaining their different AI development strategies and roles in the global AI landscape, linking key features of each NIS to their broader contributions and emphasizing their unique focuses as outlined in the research objectives. With this detailed approach, the study aims to systematically and empirically understand how the U.S. and South Korea's distinct NIS shape their AI research, development strategies, and overall influence on the global AI scene.

AI National Innovation Systems in the U.S. and South Korea: Overview

Overall Landscape in the U.S.

The United States is a global leader in Artificial Intelligence (AI) research, driven by a vibrant ecosystem that emphasizes both fundamental principles and practical uses. Its strength lies in key areas like machine learning, deep learning, natural language processing, computer vision, and robotics (NSF, Ongoing), with the National Science Foundation (NSF) actively encouraging innovation (NAIRI, 2024). AI applications are crucial for national security, economic progress, and societal well-being (NSF, Ongoing), as demonstrated by the U.S. Air Force's use of AI for strategic intelligence (Eddins, 2024) and the National AI Laboratory program, which promotes wider adoption (NAIRI, 2024). A key component of the U.S. strategy is the development of trustworthy and ethically responsible AI systems, which address issues such as algorithmic bias and data misuse (NSF, Ongoing). Public opinion also raises ethical concerns (McClain et al., 2025), reinforced by government efforts and dedicated AI agencies (NSF, 2024).

Programs such as the National AI Research Resource (NAIRR) further democratize AI research by expanding access to computing power, data, software, and training, encouraging broader participation across the field. The strength of U.S. AI research is significantly bolstered by a network of top institutions, including renowned universities such as MIT, Stanford, and Carnegie Mellon, which foster interdisciplinary collaborations and advanced research facilities. Government-funded programs, such as the NSF-led National AI Research Institute initiative, connect over 500 institutions worldwide to address both fundamental and applied challenges in AI. Initiatives like the NAIRR pilot program boost this collaborative environment by providing better access to high-performance computing and advanced tools (NSF, Ongoing).

Additionally, government and industry investments are crucial to the development of AI. The National Artificial Intelligence Initiative Office (NAIO) manages increasing federal funding for AI R&D across multiple agencies (Holohan, 2025), with significant growth projected through 2025. At the same time, the private sector drives much of this progress, with growing investments (NSCAI, 2021) from tech giants such as Amazon, Google, and Nvidia (NSF, 2024), as well as a vibrant AI startup scene that attracts significant venture capital (Maslej et al., 2025).

These companies also work closely with academic institutions, helping connect research and real-world application (NAIRI, 2024). The U.S. AI talent pipeline is essential; while it has historically attracted top global talent and increased the number of AI graduates (Olander & Flagg, 2020; MacroPolo, 2025; Abdulla & Chahal, 2023), ongoing concerns persist about lagging in developing top-tier researchers (Kim, J.F., 2025). To build a sustainable workforce, various talent development efforts, including university courses, government programs such as the AI Talent Surge, and industry-led training, are working to meet the growing demand for skilled AI professionals.

Overall Landscape in South Korea

South Korea is actively pursuing global AI leadership by leveraging its strengths in semiconductor manufacturing (McFaul et al., 2023). A key focus involves developing domestic large-scale language models (LLMs) and generative AI capabilities to achieve AI independence and decrease reliance on foreign models (Kim E., 2025). This emphasis on indigenous AI, supported by substantial government investment, aims to secure a competitive edge in the global AI market (McFaul et al., 2023).

Beyond technological progress, South Korea prioritizes the ethical development of AI and building public trust by striking a balance between rapid advancement and individual rights through clear standards and robust regulatory frameworks. The country also concentrates its AI research on applications in critical sectors, such as public services, healthcare, smart manufacturing, and robotics (AIPRM Team, 2024), aligning with its 'Digital New Deal' to improve the quality of life and industrial competitiveness.

Dedicated agencies, such as the AI Policy Center and the AI Safety Research Institute, oversee policymaking and risk mitigation, positioning South Korea as a leader in trustworthy AI. Its AI research is deeply rooted in top universities, including KAIST, Seoul National University, and POSTECH (Park & Park, 2024), which are essential for nurturing talent and fostering innovation. The government has established the National AI Research Hub in Seoul (Esser, 2024) to promote collaboration among domestic and international AI researchers, actively supporting global cooperation, as exemplified by the Global AI Frontier Institute in partnership with NYU.

The South Korean government demonstrates a clear commitment to advancing AI through significant R&D funding (McFaul et al., 2023). The Ministry of Science and ICT (MSIT) leads national AI policies, supports innovation centers, and offers incentives for private sector investment in cloud computing and AI infrastructure, thereby uniting the public and private sectors to make South Korea a global leader in AI. While the country produces many engineering graduates (McFaul et al., 2023), the rapidly increasing demand for specialized AI talent may soon outpace supply (Kim, J.F., 2025). To address this, the government has launched proactive talent development programs, encouraging collaboration between industry and academia, establishing specialized graduate institutions, and attracting international talent (Draux, 2025). Despite these efforts, a significant gender gap in AI education persists, which may hinder the future growth of South Korea's AI workforce.

Government Role, Support, and Industry Participation

Government Support and Funding Roles: A significant portion of funding for artificial intelligence (AI) research in the United States comes from both public and private sources, with technology companies and venture capitalists being the main contributors. Although South Korea does not have the same level of private sector investment as the U.S., it has still made substantial government investments in AI, demonstrating its potential to boost industrial competitiveness.

Table 1. Government Support and Funding by Feature

Feature	United States	South Korea
Coordination	The National AI Initiative Office (NAIO) orchestrates collaborative efforts spanning eleven agencies.	The Ministry of Science and Information and Communication Technology (MSIT) plays a pivotal role in formulating policies and allocating funding.
Funding Scale	There have been considerable increases in federal funding allocated to artificial intelligence research and development in recent years (Holohan, 2025).	A significant commitment from the government, comprising trillions of won designated for AI research and infrastructure (Kim and Lee, 2025)
Key Funding Agencies	National Science Foundation (NSF), National Institutes of Health (NIH), Department of Defense (DOD), Department of Energy (DOE), among others.	Primarily, the Ministry of Science and Information Technology (MSIT) collaborates with various other ministries (Kand et al., 2024).
Key Programs	National AI Research Institutes, the NAIRR pilot, and core research programs (NSF, Ongoing)	National AI Research Hub, AI Policy Center, and AI Safety Research Institute (Esser, 2024)
Policy Focus	Balancing innovation with ethical and societal risks while enhancing United States leadership (CISA, Ongoing)	Aiming to establish itself as a global leader in artificial intelligence, while promoting reliable AI and prioritizing strategic industrial growth.

Table 2. Government Roles and Focus – Key Initiatives and Priorities by Country

Country	Government Role and Focus	Key Initiatives and Priorities
United States	A decentralized approach in which governmental and private sector investments propel artificial intelligence (AI) research. This fosters advancements in defense, healthcare, and foundational AI research.	The initiatives of DARPA, such as the AI Next Campaign (2018) and the National AI Initiative (2021), along with the agency's support for defense, healthcare, and foundational AI research, exemplify a commitment to advancing technology and innovation in critical sectors.
South Korea	A comprehensive initiative facilitated by the government aims to advance the development of artificial intelligence with an emphasis on national strategy. This initiative places a high priority on artificial intelligence in the domains of manufacturing, robotics, and smart cities, leveraging the nation's capabilities in industrial automation and semiconductor technology.	The AI National Strategy (2019), the Digital New Deal (2020), and the concentrated advancement of manufacturing, robotics, and intelligent urban development.

Industry Participation and Collaboration: While both nations recognize the importance of collaboration among industry, government entities, and academic institutions in advancing artificial intelligence, their partnership strategies vary considerably. The United States primarily relies on private research labs to drive innovation, whereas South Korea emphasizes government-led partnerships aimed at achieving specific AI objectives.

Table 3. Industry Participation and Investment

Characteristic	United States	South Korea
Investment Scale	The private sector plays a leading role, demonstrating significant growth in recent years (Alex, et al., 2025). Moreover, the increase in investment from large corporations and investment funds is attracting foreign investment (McFaul et al., 2023).	Increasing investment from large corporations and investment funds, attracting foreign investment (McFaul et al., 2023)

Characteristic	United States	South Korea
Key Participating Companies	Significant investments from prominent technology corporations (Google, Amazon, Microsoft, Meta, Nvidia) (912)	The active engagement of prominent conglomerates, including Samsung, LG, SK Group, and Hyundai, in artificial intelligence research and development is noteworthy.
Startup Ecosystem	A dynamic ecosystem of artificial intelligence startups draws considerable venture capital, especially within the realm of generative AI (Draux, 2025).	A robust ecosystem of AI-oriented startups, commonly referred to as 'scale-ups,' is catalyzing innovation (Esser, 2024).
Academia-Industry Collaboration	Active collaborations that facilitate knowledge transfer and collaborative research.	Enhancing collaboration among universities, research institutions, and the industry (Esser, 2024)

Areas of Research Focus

Considering the diverse economic, technological, and cultural backgrounds of each country, a comparison of artificial intelligence research in South Korea and the United States reveals different primary focus areas. The following section highlights these key research fields.

The United States continues to lead in AI development, with deep learning and computer vision playing vital roles. These fields see advancements in frameworks, facial recognition, and autonomous vehicles, driven by top universities and industry giants like Google and NVIDIA. NLP research also thrives, with large language models (LLMs) being developed by companies such as Microsoft and OpenAI. Additionally, the U.S. excels in AI ethics and policy, emphasizing accountability and fairness through interdisciplinary research. Major investments focus on AI applications in national security and defense, including cybersecurity and autonomous systems. AI continues to significantly impact business, especially in finance, for risk management and fraud detection.

South Korea emphasizes robotics and automation, driven by its advanced manufacturing industry, which includes industrial automation, collaborative robots (COBOTS), and humanoid robots. The country heavily invests in healthcare AI, focusing on personalized medicine, health monitoring, and diagnostics, supported by government initiatives. It also works on developing Natural Language Processing (NLP) tailored to the Korean language and culture, creating conversational agents for education, customer service, and social media. Additionally, South Korea is committed to Smart Cities and IoT integration, researching energy efficiency, traffic management, and urban planning. Progress in educational technology, such as intelligent tutoring systems and personalized learning platforms, remains a main focus.

Table 4. Research Priorities and Focus by Feature

Feature	United States	South Korea
Basic Research	There is a strong emphasis on advancing fundamental artificial intelligence methodologies, including machine learning (ML), deep learning (DL), natural language processing (NLP), computer vision (CV), and robotics.	Fundamental research is present; however, there should be a more robust emphasis on sectors such as AI and semiconductors (McFaul et al., 2023).
Key Sector Applications	There is a strong emphasis on national security, healthcare, finance, and advanced manufacturing.	Emphasizing the importance of public services, healthcare, advanced manufacturing, robotics, and the promotion of artificial intelligence across diverse industries (Esser, 2024).

Feature	United States	South Korea
Ethical AI	There is a growing concern regarding safety, fairness, transparency, accountability, and the need to address bias (NSF, Ongoing).	A significant emphasis is placed on ethical development and the establishment of trust, achieving a balance between innovation and the protection of rights (Baig and Gardezi, 2025).
Research Resource Accessibility	Initiatives such as the NAIRR seek to democratize access to computing resources, data, and educational opportunities.	Concentrate on establishing AI innovation hubs and data centers to facilitate infrastructure development (Esser, 2024).
LLMs and Generative AI	Robust research and development in large language models (LLMs) and generative artificial intelligence; considerable engagement from the private sector (Alex, et al., 2025).	The nation places significant emphasis on developing its own Large Language Model (LLM) and generative artificial intelligence (AI) capabilities.

Table 5. Research Focus Areas and Examples by Country

Country	Focus Areas	Examples
United States	Deep learning, foundational artificial intelligence research, autonomous vehicles, medical applications of artificial intelligence, military and cybersecurity aspects of artificial intelligence, artificial intelligence chips, and large-scale artificial intelligence models.	Guidelines for the Prevention of Bias in Artificial Intelligence: OpenAI, Google DeepMind, Pentagon Projects, NVIDIA, Intel, GPT, Gemini
South Korea	Robotics, artificial intelligence, semiconductors for artificial intelligence hardware, smart cities, educational applications of artificial intelligence, artificial intelligence ethics, and the regulation of artificial intelligence.	Humanoid robots, industrial automation, Samsung, and SK Hynix.

Collaboration and Ecosystem

A comparative analysis of artificial intelligence research in the United States and South Korea reveals distinct approaches focused on fostering collaboration and developing ecosystems. Here is a systematic summary of the key similarities and differences.

Research Environment and Ecosystem

The United States boasts a diverse AI ecosystem, propelled by top universities, research institutions, and leading tech companies, including Google Research, MIT, Stanford, UC Berkeley, the Microsoft AI Institute, and OpenAI. This robust foundation is reinforced by substantial venture capital funding for AI startups, fostering rapid innovation, and significant federal investment in high-risk research from agencies like DARPA. A key advantage is the extensive collaboration between academia and industry, which facilitates information exchange, supports research, provides internships, and advances the development of real-world AI applications. This dynamic environment, alongside flexible, interdisciplinary education and numerous online learning options, attracts a talented and diverse global workforce, solidifying the U.S. as a premier worldwide AI hub.

South Korea's AI landscape is shaped by a government-led strategy that actively encourages growth through initiatives such as the 'National AI Strategy,' which increases funding and research activities. The government plays a crucial role in advancing AI by emphasizing technical expertise and foundational knowledge through structured university programs at institutions like KAIST and POSTECH, renowned for developing top AI talent. Key sectors such as manufacturing, healthcare, and smart cities are primary targets for AI integration, often spearheaded by leading companies like Samsung and LG, which capitalize

on the nation's semiconductor strengths. Although still in its early stages of development, South Korea's startup scene is expanding rapidly, supported by government funding and innovative initiatives. Additionally, the government provides grants and scholarships to promote AI education in science and engineering, building upon a strong foundation of early STEM training; the tech industry fosters competition.

Collaboration Mechanisms

The United States' approach to AI development is deeply rooted in a culture of open research and collaboration. This is evident from the widespread dissemination of research findings at academic conferences and through open-access journals, fostering a transparent and shared knowledge environment. A strong focus on interdisciplinary methods means that AI research often overlaps with fields such as robotics, neuroscience, and cognitive science, leading to numerous advancements and practical applications. Alongside these collaboration efforts are distinct cultural and educational factors. The U.S. greatly benefits from attracting a diverse global talent pool, which broadens research perspectives and consistently drives innovation. Additionally, a strong entrepreneurial culture actively encourages scholars to translate their cutting-edge research into new business ventures, thereby accelerating the commercialization and practical application of AI technologies.

In contrast, South Korea's collaboration mechanisms are more structured and formalized. Government-funded research projects play a crucial role in bridging academia and industry, often with clearly defined objectives and outcomes that are guided by government regulations. A key feature of South Korean AI development is its strong focus on "Government-Academia-Industry" partnerships, fostering coordinated efforts across the public and private sectors. These collaboration mechanisms are profoundly shaped by the country's cultural and educational influences. South Korea's education system, with its emphasis on Science, Technology, Engineering, and Mathematics (STEM), develops a highly skilled workforce essential for AI research. Culturally, collectivist values strongly influence collaborative approaches, frequently resulting in research initiatives that follow a consensus-driven method, promoting cohesion and shared goals within the AI development community.

Policy and Regulation

The United States maintains a mostly permissive regulatory environment for AI, emphasizing quick experimentation and innovation. Even though there is no comprehensive federal AI law, discussions on data privacy and AI ethics influence ongoing research. Federal agencies and states are increasingly providing guidance and enacting targeted laws, often building on existing laws related to consumer protection, civil liberties, and data privacy. This approach focuses on voluntary industry commitments and risk management to prevent hindering innovation in the competitive global AI landscape, even as broader federal regulations are still under discussion.

Conversely, South Korea takes a more proactive and centralized approach to AI regulation, advocating for comprehensive frameworks that prioritize ethical standards and safety. Leading this effort is the "National Artificial Intelligence Strategy," which aligns policies with national ambitions to position South Korea as a global AI leader by 2030. This plan highlights promoting trustworthy AI, developing ethical guidelines, and ensuring the safe and responsible deployment of AI technologies. South Korea's recently enacted AI Basic Act, for example, adopts a risk-based approach, establishing specific obligations for "high-impact" AI systems and emphasizing transparency and accountability, demonstrating a commitment to balancing innovation with responsible, human-centered AI development.

Talent Pool and Educational Framework

The United States boasts a diverse and extensive AI talent pool, shaped by prestigious universities such as Harvard, MIT, Stanford, and UC Berkeley, alongside leading research centers including Microsoft's AI Institute, Google AI Research Center, and OpenAI. This vibrant ecosystem fosters strong connections between academia and industry, enhancing talent recruitment, research, and internship opportunities. As a global leader in AI research and innovation, the U.S. attracts top talent worldwide through flexible, multidisciplinary higher education programs in data science, computer science, ethics, and engineering. Early undergraduate research opportunities, as well as accessible online courses and boot camps, further expand AI education across the nation (Bryant, 2025).

South Korea has invested heavily in developing its AI talent, primarily through government-led initiatives such as the "National AI Strategy" and various educational programs. Institutions such as KAIST and POSTECH are known for their specialized AI programs and regularly graduate highly qualified students. The technology sector, especially companies like LG, SKC, and Samsung, actively seeks AI expertise, making the job market highly competitive. South Korea's educational system stresses structured AI programs at universities, focusing on both technical skills and fundamental knowledge. The government offers significant support through grants and scholarships to promote AI education in science and engineering, backed by a strong focus on STEM education from an early age to build a strong foundation for future AI researchers.

Table 6. Talent Development and Availability

Feature	United States	South Korea
Talent Attraction	Attracts premier global AI talent and functions as a principal destination for distinguished researchers (Olander & Flagg, 2020).	The nation produces a significant number of engineering graduates and is becoming an increasingly appealing destination for artificial intelligence researchers (Kim, J.F., 2025).
Talent Cultivation	The increasing number of graduates in the field of artificial intelligence raises concerns regarding the potential for falling behind China (Olander & Flagg, 2020).	Notwithstanding the substantial production of engineering graduates, the demand for artificial intelligence talent surpasses the available supply (Kim, J.F., 2025).
Development Programs	A variety of initiatives are orchestrated by universities, government entities, and the industry, particularly in terms of AI talent acquisition efforts.	The proactive execution of various government-initiated programs, encompassing collaborations between industry and academia as well as specialized graduate institutions (Kim & Lee, 2025).
Challenges	The increasing dependence on foreign talent necessitates strengthening the domestic talent pipeline (Kim, J.F., 2025).	The potential shortage of talent and the gender imbalance within the field of artificial intelligence education.

Research Outcomes and Impact

The United States leads in global AI research, excelling in both the number of patents and published articles in top academic journals. This dominance is mainly driven by a vibrant startup scene that fosters rapid innovation and the commercialization of AI. The ecosystem supports extensive experimentation and applications across various industries, backed by substantial venture capital and a culture that encourages turning research into businesses. This lively environment ensures ongoing innovation and the swift deployment of AI technologies.

South Korea has seen a significant rise in published AI research papers, especially in recent years, highlighting its growing contributions to the field. Its AI development strategy focuses on specific research areas aligned with government priorities, such as robotics, natural language processing, and medical AI. This targeted approach aims to use national strengths to establish global leadership in these key fields. The government actively supports this effort through funding and various programs, fostering a growing startup ecosystem and emphasizing AI applications in major industries like manufacturing, healthcare, and smart cities.

Table 7. AI Research Outcomes, Innovation, and Impact

Feature	United States	South Korea
Papers	Historically, the United States has been a leading producer, as research typically yields a higher citation impact (Park and Park, 2024).	The global ranking in output has declined; however, substantial contributions are still being made (Park and Park, 2024).
Patents	A robust ecosystem for artificial intelligence patents (McFaul et al., 2023)	As a preeminent entity in the realm of artificial intelligence patent submissions on a per capita basis, South Korea holds the third position globally (Esser, 2024).
Innovation	Generates a larger quantity of significant artificial intelligence models and leads in advanced artificial intelligence development (Buntz, 2025).	An expanding innovation ecosystem demonstrates excellence in semiconductor manufacturing for artificial intelligence (Esser, 2024).
Adoption	The adoption of artificial intelligence is experiencing growth across a multitude of industries (Alex, et al., 2025).	High rates of artificial intelligence adoption are particularly prominent among large and emerging technology-oriented enterprises (Esser, 2024).
Talent	The foremost destination for exceptional artificial intelligence talent (MacroPolo, 2025)	Becoming an increasingly attractive destination for artificial intelligence researchers (MacroPolo, 2025)

Global Influence and Leadership

A comparative analysis of artificial intelligence research in the United States and South Korea highlights two different approaches to leadership, innovation, and global influence, each offering distinct strengths and contributions.

Research and Development Investment

The United States has consistently played a leading role in the global artificial intelligence landscape, primarily due to substantial government funding, venture capital, and private sector investments. The U.S. government has supported AI innovation through initiatives like the National Artificial Intelligence Initiative Act and various funding agencies, including the National Science Foundation (NSF). Major companies, such as Google, Microsoft, and OpenAI, are at the forefront of this field, showcasing groundbreaking research and fostering extensive public-private partnerships. South Korea has dramatically increased its investment in artificial intelligence through strategic partnerships and government initiatives. By 2030, the Korean National AI Strategy plans to draw trillions of won in R&D investments, positioning the country as a global leader in AI. Its AI research remains at the forefront, supported by government-funded institutions and major firms such as LG, Naver, and Samsung.

Global Influence and AI Ethics

The United States has significantly impacted AI ethics and regulations due to its leading AI industry and the global influence of its tech companies. Groups such as IEEE and the Partnership on AI have proposed numerous frameworks to promote ethical AI and transparency. South Korea focuses on the ethical

development of artificial intelligence and promoting its responsible use. The National AI Strategy outlines the government's ethical principles for AI, emphasizing transparency, human rights, and fairness. This strategy aims to position South Korea as a leader in AI ethics in Asia, aligning with its scientific and cultural ambitions.

AI Leadership and Patents

Thanks to collaboration between industry and academia, the United States remains a leader in artificial intelligence patents and innovation. Companies like Google and OpenAI set global standards by developing foundational AI models, including Transformers and large language models. South Korea is rapidly advancing in artificial intelligence patent filings, particularly in areas such as communication, robotics, and autonomous vehicles. Samsung, for example, is a leading developer of AI hardware and holds a significant portfolio of AI patents, especially in semiconductor technology, where AI capabilities are integrated directly into chip designs.

Areas of Specialization and Innovation

The United States continues to lead in foundational models and general artificial intelligence, encompassing areas such as natural language processing, image recognition, and reinforcement learning. It is a pioneer in creating large language models (LLMs), which are fueling major innovations in industries such as finance and healthcare. South Korea has established specialized markets in applied artificial intelligence, especially in sectors like robotics, smart cities, and the automotive industry. Its emphasis on fifth-generation telecommunications technology enhances AI applications in connectivity. Furthermore, AI integration in gaming, particularly in esports, is a rapidly expanding area where South Korea shows significant expertise.

Regulatory Framework

A comprehensive review of artificial intelligence research in the United States and South Korea, examined through their respective regulatory frameworks, reveals both interesting similarities and differences shaped by each country's distinct political, cultural, and technological environments.

Regulatory Frameworks

The United States adopts a largely decentralized approach to AI regulation, with states and private companies responsible for setting their own standards. The Federal Trade Commission (FTC) primarily protects consumers and ensures data privacy. Legislation like the "Algorithmic Accountability Act" exemplifies efforts to increase accountability and transparency in AI. However, the absence of a unified federal AI regulation framework leads to an industry-driven approach that emphasizes self-regulation. South Korea has created a more centralized regulatory system through government efforts. The 2019 "National AI Strategy" sets clear goals for the ethical use of AI, transparency, and data security. Additionally, the "Personal Information Protection Act (PIPA)" - similar to the EU's GDPR - sets strict rules for the use of data in AI research.

Cultural and Societal Influences on AI Governance

The United States' strategic approach emphasizes market-driven growth and innovation, granting businesses significant freedom to experiment while expecting voluntary adherence to ethical standards. Discussions on AI ethics also cover protection for individual liberties, free speech, and the need to limit excessive government intervention. South Korea's structure is influenced by its collectivist culture, which highlights social harmony and community welfare. Government regulation related to technology, often viewed as protecting societal interests, has strong backing. Consequently, Korean policies that focus on community well-being prioritize artificial intelligence that reduces societal risks and increases benefits.

Development of AI Collaboration Between the U.S. and South Korea

The United States and South Korea have significantly enhanced their collaboration in artificial intelligence research from 2000 to 2024, encompassing areas such as deep learning, robotics, natural language processing (NLP), and AI ethics. The key advancements include:

Early 2000s (2000–2010): Foundation Building and Initial Collaborations

Artificial Intelligence (AI) research was still in its early stages, and major collaborations were rare. South Korean academic institutions, including the Korea Advanced Institute of Science and Technology (KAIST), Pohang University of Science and Technology (POSTECH), and Seoul National University, began cooperative efforts with American universities like Carnegie Mellon University, the Massachusetts Institute of Technology (MIT), and Stanford University in fields like robotics and machine intelligence. Additionally, research institutes in the United States often partner with leading South Korean companies such as Samsung, LG, and Hyundai to incorporate AI into consumer electronics and the automotive industries.

2010s (2011–2020): The Rise of Deep Learning and Global AI Partnerships

The development of artificial intelligence (AI) in South Korea has been significantly driven by the deep learning revolution, led mainly by respected institutions such as Harvard, OpenAI, Google DeepMind, and various U.S.-based organizations. Major South Korean tech companies, such as Samsung, Naver, and Kakao, have significantly increased their investments in AI research and development, while also launching collaborative projects with their American counterparts. To encourage cooperation in AI research, the U.S. and South Korea have signed several agreements, primarily focusing on areas such as military applications, medical AI, and autonomous vehicles. As discussions about the ethical impacts of AI grow, joint efforts to ensure responsible AI governance are starting to take shape.

2020–2024: Strategic AI Alliances and Technological Advancements

The United States and South Korea have significantly strengthened their partnership in artificial intelligence, especially in AI hardware using semiconductors, through collaborations with major companies such as Samsung, SK Hynix, NVIDIA, and Intel. Cooperation in defense-related AI has expanded, focusing on military AI strategies, cybersecurity, and the development of autonomous weapons. The passage of the US CHIPS Act, along with South Korea's national AI plan, has significantly advanced joint efforts in AI semiconductor and computing research. As a result of this legislation, Samsung is working on building a semiconductor foundry in Texas. Additionally, joint research projects in areas like AI-driven biotechnology, quantum computing, and generative AI have increased.

Findings and Discussion

The approaches of South Korea and the United States toward artificial intelligence development are distinct but complementary. The United States holds a leadership position in AI innovation and talent acquisition, primarily due to its esteemed academic institutions, significant corporate sector investments, and a strong focus on both basic research and key sector applications. Although the U.S. government plays a vital role in funding and coordinating AI research, there is an increasing emphasis on the social and ethical implications of the technology. Initiatives aimed at democratizing AI research resources seek to promote widespread participation in advancing the field. In contrast, South Korea takes a more strategic and government-led approach to developing AI. The country emphasizes the importance of AI hardware and the development of proprietary AI models by leveraging its global leadership in semiconductor manufacturing. South Korea aims to position itself as a responsible leader in the global AI arena by stressing

ethical AI practices and building trust. The government's substantial funding, the creation of research centers, and the promotion of international collaborations demonstrate a strong commitment to achieving its ambitious goal of becoming a leading AI powerhouse, despite challenges in bridging the growing gap between the supply and demand for specialized AI talent. In the realm of research output, South Korea leads globally in AI patent filings when adjusted for its population. In contrast, the United States has historically held a dominant position in paper publishing and continues to produce highly influential research. The increasing adoption of AI across various industries in both countries highlights the transformative impact this technology has on their economies. South Korea is becoming an attractive hub for AI expertise; however, the United States remains the top destination for researchers in this field. This comparative analysis reveals that both South Korea and the United States are making significant strides in AI research, with their distinct goals and strengths further propelling the global development of AI.

Implications for Future Research and International Collaboration

This comparative analysis of AI innovation systems in the United States and South Korea reveals key implications for future research directions and global collaboration efforts. The distinct strengths and strategic focuses of each country present valuable opportunities to explore the effectiveness and transferability of various AI development models, while also identifying potential challenges and opportunities for international partnerships.

Future research could explore the detailed effects of different regulatory strategies on AI innovation. Given the U.S.'s more permissive approach and South Korea's proactive, government-led regulation, which emphasizes ethics and safety, long-term studies could assess how these contrasting frameworks impact the speed, direction, and public acceptance of AI development in each country. Additional research is also needed to understand the long-term effects of various talent development strategies, such as the U.S.'s attraction of global talent versus South Korea's focused STEM education and structured programs, on the composition and skills of their respective AI workforces.

Analyzing the success of commercialization driven by the U.S.'s venture capital and startup ecosystem compared to South Korea's targeted, industry-specific initiatives and government-supported programs would yield valuable insights. Furthermore, studying the development and practical application of ethical AI frameworks in both contexts, particularly in relation to data privacy and algorithmic bias, presents significant opportunities for ongoing scholarly research. In terms of international collaboration, the findings highlight both opportunities for synergy and potential areas of tension.

The U.S.'s leadership in foundational research and its open collaboration model, along with its diverse talent pool, could provide valuable resources and partnerships for South Korea's more structured and sector-specific AI development. Conversely, South Korea's expertise in targeted research fields, such as robotics and medical AI, combined with its proactive regulatory foresight, could complement the U.S.'s efforts.

Opportunities for collaboration are significant in developing international AI standards and governance frameworks, where both countries can share their unique perspectives on balancing innovation with ethical responsibilities. However, challenges may arise in aligning differing regulatory philosophies and geopolitical considerations, especially as both nations navigate their relationships within the broader global technology landscape and seek to secure their roles as AI leaders. Understanding how these distinct national innovation systems can work together or diverge—maximizing global AI progress while addressing shared ethical and security issues—will be a key focus for ongoing international dialogue and collaborative efforts.

Limitations

This research, which uses a Comparative Case Study Design based on the National Innovation Systems (NIS) framework, naturally has several limitations that should be acknowledged. Since this is a comparative case study of only two countries—the U.S. and South Korea—the findings may have limited generalizability. While this approach provides detailed and nuanced insights, emphasizing unique features, the conclusions about AI development pathways might not easily apply to other nations with different economic, social, or political contexts. The specific dynamics observed in these two major AI players may not be universally relevant, so any efforts to generalize should be cautious, focusing on context-specific insights rather than broad predictions.

Measuring and comparing national innovation systems, especially in a rapidly evolving field like AI, presents inherent challenges. The NIS framework, although comprehensive, depends on identifying complex interactions and flows among various actors and institutions. Accurately capturing these dynamic relationships and their specific effects on AI outcomes can be difficult, which may lead to oversimplifications or overlook subtle yet important factors. Data availability and comparability across countries also present challenges, as metrics for R&D investment, talent development, or industry involvement may vary in collection and reporting, impacting the accuracy and depth of quantitative comparisons. Furthermore, while policy documents, academic papers, and industry reports provide extensive information, they may not always fully reveal informal collaborations, unstated priorities, or real-time strategic changes within these complex ecosystems.

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