Narrative Review Article

Made in China and Coded in India? A Dynamic Industrial Capabilities Perspective

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ABSTRACT

As artificial intelligence (AI) becomes increasingly integrated into manufacturing, digital platforms, business services, and industrial applications, the conventional characterization of global specialization as "Made in China and Coded in India" warrants reconsideration. Although this phrase captures important differences in comparative advantage, it provides an incomplete account of the technological and organizational capabilities accumulated in the two countries. From the perspective of dynamic industrial capabilities, this paper argues that the two countries have developed different information technology (IT) capability structures. India has developed strong human-capital- and service-oriented IT capabilities, whereas China has accumulated a more domestically embedded combination of platform, infrastructure, systems-integration, and manufacturing-linked digital capabilities. These differences may condition how talent, data, research investment, computing resources, and organizational capabilities are converted into AI research, models, products, services, and industrial applications. India's historically weaker linkages among export-oriented IT services, proprietary product development, and domestic industrial applications may constitute a capability-conversion constraint. China's platform- and manufacturing-linked structure appears to provide more channels for model development and industrial deployment. However, patent and model counts capture only selected dimensions of capability, the literature reviewed is necessarily selective, and the evidence does not establish direct causality. The comparison suggests that global competitiveness in AI and other emerging industries depends not only on current comparative advantage, but also on economies' ability to recombine accumulated technological, organizational, and industrial capabilities.

Keywords: "Made in China and Coded in India"; artificial intelligence (AI); IT capability structures; dynamic industrial capabilities

INTRODUCTION

The phrase "Made in China and Coded in India" captures a familiar understanding of China's and India's roles in the global economy. China is commonly viewed as the world's manufacturing center, whereas India is widely recognized as a global hub for software services and information technology (IT) outsourcing. This distinction reflects real differences in the two countries' export structures and patterns of specialization and is broadly consistent with a static comparative advantage perspective. However, artificial intelligence (AI) is increasingly blurring the conventional boundaries among manufacturing, software, and services. As AI becomes

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integrated into production systems, digital platforms, and business processes, it is necessary to reconsider whether the familiar distinction between "making" in China and "coding" in India still provides an adequate account of the two countries' technological capabilities and development trajectories.

Addressing this question requires examining the relationship between accumulated IT capabilities and emerging AI capabilities. At the firm level, AI capability has been conceptualized as an organizational capacity to orchestrate tangible, human, and intangible AI-related resources (1). Extending this logic to the industrial level, AI development depends on the capacity to generate and combine algorithms, data, and computing power and to convert them into models, products, services, and applications. These processes require technical talent, sustained research and development (R&D), investment, computing and digital infrastructure, organizational capacity, product-development experience, and opportunities for commercial and industrial deployment (2). Accumulated IT capabilities are relevant because software engineering, cloud systems, digital platforms, databases, data governance, systems integration, and enterprise digitalization influence how these resources are organized and applied. IT capability is therefore not equivalent to AI capability, but it provides an important technological and organizational basis for mobilizing, recombining, and commercializing AI-related resources.

Existing studies and international indices compare China and India across export specialization, digital ecosystems, innovation, and AI performance, but these dimensions are often examined separately or presented as rankings. By "IT capability structure," this paper refers to the configuration of technological, organizational, and application-oriented IT capabilities accumulated within an economy. Less attention has been paid to how such historically accumulated structures condition the conversion of AI-related resources into different outcomes. China and India provide a useful comparison because they have accumulated substantial but differently structured IT capabilities through distinct forms of specialization and global integration. India developed internationally competitive strengths in technical human capital, software services, IT outsourcing, project delivery, and business-process outsourcing (BPO), while its AI ecosystem has also expanded through startups, digital public infrastructure, research initiatives, and enterprise adoption. Nevertheless, relative to the scale of its talent base, India displays more limited performance in selected dimensions of R&D, private investment, frontier-model production, computing infrastructure, and formalized inventive output (2). China presents a different capability configuration. Although it is less prominent in international IT-service exports, it has accumulated substantial capabilities in domestic platforms, cloud services, payment systems, industrial digitalization, systems integration, AI-related research, and manufacturing-linked applications. These contrasting patterns raise a capability-conversion question: how do different IT capability structures influence the ways in which technical talent, knowledge, capital, data, and infrastructure are transformed into AI research, models, products, services, and applications?

This paper examines this question through a dynamic industrial capabilities perspective. Unlike static comparative advantage, which emphasizes specialization based on existing relative costs and factor endowments, dynamic industrial capabilities refer to the accumulated and evolving ability of firms, industries, and supporting institutions to mobilize, recombine, and extend knowledge, skills, infrastructure, and organizational resources toward new technological and commercial opportunities. For analytical clarity, the review distinguishes among IT services, digital platforms and products, infrastructure, technological innovation, AI commercialization and industrial deployment, as related but distinct dimensions of capability, rather than treating any single dimension as a comprehensive measure of national IT or AI capability. This paper does not seek to reproduce existing cross-country rankings of national AI performance. Instead, it uses China and India as contrasting cases to examine how service-led, platform- and product-based, and manufacturing-linked IT capabilities may condition different AI development pathways. The remainder of the paper is organized as follows. It first reviews the literature on outsourcing, foreign direct investment (FDI), comparative advantage, and dynamic industrial capabilities. It then analyzes India's human-capital advantage and the opportunities and constraints of service-led development, reassesses the distinct IT capability structures developed in China and India, and examines how these structures may be associated with different patterns of AI research, commercialization, and industrial deployment.

LITERATURE REVIEW

Both China and India initially pursued a relatively inward-oriented development strategy, although their subsequent reform paths and patterns of global integration diverged substantially. The existing literature mainly analyzes these differences from the perspective of comparative advantage. This review connects that literature to a dynamic industrial capabilities perspective.

India possesses abundant skilled, English-speaking manpower; however, technological lags and inadequate transportation infrastructure have historically constrained the development of its manufacturing sector (3). During the late 1990s, many Indian manufacturing firms increasingly relied on cross-border outsourcing to reduce costs and improve efficiency (4). This strategy may have limited the ability of some Indian manufacturing firms to accumulate production capabilities and benefit from future technological advances in the manufacturing process (5). At the same time, developments in telephony, fiber optics, and satellite communications helped India build high-end telecom facilities and infrastructure which are on par with global standards, paving the way for the expansion of IT-BPO services. Global airlines began outsourcing back-office work to India in the 1980s, followed by IT companies in later decades (6). India's integration into the global economy thus became increasingly associated with service-sector strengths, even as manufacturing upgrading remained more uneven (7).

China followed a different path. Since the early 1980s, the Chinese government has actively sought foreign direct investment (FDI) as a means of developing manufacturing capabilities, expanding access to international markets, and promoting export growth, all of which are often cited as key drivers of China's manufacturing sector (8,9). As China became increasingly integrated into global value chains and emerged as the "world's factory," much of the existing literature has focused on the role of FDI in promoting manufacturing exports (10). However, this export-centered perspective may overlook the broader ways in which FDI, production networks, and industrial policy may also have contributed to the accumulation of manufacturing capabilities and later technological upgrading. These effects were neither uniform nor identical across sectors and regions.

This paper connects to a broader literature on dynamic industrial capabilities. Rodrik (11) argues that Japan, South Korea, China, and other growth superstars did not rely simply on specializing according to existing comparative advantage, but also built new industrial capabilities over time. Similarly, Coniglio et al. (12) suggest that a country's specialization evolves dynamically as new capabilities emerge and new products are added to its export basket. In this review, dynamic industrial capabilities refer to the accumulated and evolving ability of firms, industries, and supporting institutions to mobilize, recombine, and extend knowledge, skills, infrastructure, and organizational resources into new products, production systems, and technological applications. From this perspective, the contrast between China and India concerns not manufacturing versus services, but the different types of capabilities accumulated through globalization. The technological and organizational capabilities accumulated alongside China's manufacturing expansion may have provided complementary conditions for later development in digital platforms, industrial software, and selected AI applications. Lundvall and Rikap (13) further examine China's rise in AI through the co-evolution of corporate and national innovation systems. Building on this literature, this paper compares China and India to examine how different forms of global integration may have shaped their long-term capability structures and technological trajectories. Consistent with Rodrik's argument (11), long-term competitiveness may depend not only on current specialization, but also on the ability to build, recombine, and redirect capabilities under conditions of technological change.

INDIA'S HUMAN-CAPITAL ADVANTAGE AND THE OPPORTUNITIES AND CONSTRAINTS OF SERVICE-LED DEVELOPMENT

India's integration into the global technology economy was driven primarily by the expansion of software services, IT outsourcing, and BPO. This development path drew on a large pool of technically trained, English-speaking workers, the growing demand among firms in advanced economies for offshore services, and the organizational expansion of Indian IT companies capable of managing complex projects across borders. Indian firms became important providers of software development, testing, maintenance, systems support, consulting, customer service, and back-office operations. These activities integrated India deeply into global service networks and created a distinctive comparative advantage in internationally delivered IT and business services.

India's human-capital advantage extends beyond the domestic IT-service industry. Indian engineers, software professionals, and executives have played an important role in multinational technology firms, research institutions, and overseas innovation ecosystems. This international mobility demonstrates India's capacity to educate and supply technical and managerial talent at scale. It has also created cross-border professional networks, knowledge flows, and reputational advantages that have reinforced the country's position in global technology services. However, the international success of Indian talent should be distinguished from the domestic accumulation of firm-level R&D, proprietary products, computing infrastructure, and industrial application capabilities.

The service-led model generated significant organizational and technological capabilities. Indian IT and BPO firms developed expertise in project management, software engineering, systems integration, process standardization, quality control, consulting, and the coordination of globally distributed teams. These are genuine and economically valuable capabilities rather than merely low-cost labor advantages. Yet the dominant business model was often organized around the requirements of foreign clients and international service markets. In what Ishigami (14) describes as an "external–external" model, Indian firms served predominantly foreign firms and foreign markets. This orientation may have directed learning and investment toward reliable client delivery, customization, and cost-efficient service provision, while providing weaker incentives for proprietary product development, long-horizon research, and integration with domestic manufacturing systems.

This pattern suggests that human capital does not automatically translate into a broad domestic portfolio of technological and industrial capabilities. The conversion of technical talent into proprietary software products, digital platforms, advanced research, and industrial applications also depends on conditions, including sustained R&D investment, domestic demand, patient capital, computing infrastructure, research-industry linkages, and opportunities for deployment across multiple sectors (2). India's service-led trajectory may therefore be associated with a capability-conversion constraint: it generated deep expertise in service delivery and globally coordinated software work, but historically provided fewer channels through which these capabilities could be recombined with manufacturing, hardware, domestic platforms, and capital-intensive technological development. At the same time, India's service-led development path is not static. Its domestic entrepreneurial base is diversified across technology and application-oriented industries. According to data from the Department for Promotion of Industry and Internal Trade (DPIIT), IT Services accounted for 23,338 recognized startups as of October 2025, while substantial numbers were also recorded in healthcare and life sciences, construction, education, food and beverages, professional and commercial services, agriculture, technology hardware, and finance and technology (15). This distribution indicates that entrepreneurial activity extends beyond conventional outsourcing and BPO to encompass a broader range of sector-specific applications, although recognition counts do not by themselves establish firm survival, innovation quality, commercial scale, or AI capability. This broader entrepreneurial base may create additional channels through which service-delivery expertise can be recombined with product development and sector-specific applications. The relevant question is therefore not whether India's service-led model has failed, but whether and how its accumulated human capital and organizational capabilities can be redirected toward higher-value research, proprietary products, platforms, and domestic industrial applications.

This distinction provides the basis for the next section. Rather than assuming that IT capability is adequately measured by software-service exports or outsourcing revenue, the analysis reassesses China's IT development through a broader set of capabilities, including domestic platforms, industrial digitalization, cloud infrastructure, systems integration, and links between digital technologies and manufacturing. The comparison therefore concerns different capability configurations, not a simple ranking of which country possesses a stronger IT industry.

BEYOND SERVICE-EXPORT COMPARATIVE ADVANTAGE: DISTINCT IT CAPABILITY STRUCTURES IN CHINA AND INDIA

China's strong competitiveness in manufacturing and India's remarkable achievements in software outsourcing have encouraged analysts to use IT-service export as a proxy for national IT capability. However, IT capability encompasses several related but conceptually distinct dimensions, including IT-service delivery, software and product development, digital-platform operation, cloud and data infrastructure, systems integration, and industrial digitalization. Evaluating China and India solely through software-service exports therefore risks overlooking capabilities embedded in domestic firms, platforms, infrastructure, and industrial applications.

China and India developed different configurations of IT capability. India accumulated globally competitive strengths in software services, project delivery, consulting, systems maintenance, and business-process management. At the same time, its domestic technology base has become more heterogeneous, including software-product and software-as-a-service (SaaS) firms serving a range of enterprise application areas (16), nationwide digital public infrastructure (17), and startups distributed across IT services and a range of application-oriented industries (15). China's trajectory relied less heavily on offshore service exports and developed more strongly around its large domestic market, large digital platforms, cloud services, e-commerce, mobile payments (18, 19), as well as the digitalization of manufacturing and supply chains (20). These patterns should not be interpreted as mutually exclusive national models. Rather, they indicate differences in the relative weight of service exports, domestic platforms, product development, infrastructure, and industrial integration within the two countries' IT ecosystems.

This distinction illustrates the limits of a static comparative advantage perspective. China's revealed comparative advantage has remained stronger in manufactured goods than in internationally delivered IT services, whereas India has achieved a prominent position in global IT-BPO exports. Yet export specialization does not provide a complete measure of accumulated technological and organizational capabilities. Capabilities may be embodied in domestic products, platforms, infrastructure, organizational routines, and cross-sector applications without appearing directly in service-export statistics. China's lower level of IT-service exports relative to India therefore does not by itself establish a weaker IT capability, just as India's service-export leadership does not automatically imply superiority across software products, platforms, infrastructure, and industrial digitalization. This distinction is particularly visible in the contrast between India's stronger revealed comparative advantage in IT-BPO exports and China's substantially higher patenting activity in the selected IT-related Cooperative Patent Classification (CPC) classes reported below.

Patent evidence provides one additional, although limited, perspective on these differences. Table 1 reports applications in the G06F and G06Q CPC classes for five selected countries. In 2001, China recorded 155 G06F applications and 41 G06Q applications, compared with 21 and 13, respectively, for India. Patent application levels in both countries remained substantially below those of the United States, Germany, and Japan, highlighting their relatively modest starting positions in these technology classes. By 2021, the corresponding Chinese totals had risen to 16,050 and 3,036, compared with 833 and 551 for India. China's counts were therefore approximately 19.3 times India's in G06F and 5.5 times India's in G06Q in 2021. China's application counts in both classes had also surpassed those of Germany and Japan by that year. Taken together, these differences indicate substantially greater patenting activity by Chinese applicants in the selected classes. They do not, however, provide a direct measure of overall IT capability or innovation quality. Cross-country patent comparisons may be influenced by institutional differences, filing incentives, market and applicant characteristics, and patent-family practices. The patent evidence should therefore be interpreted together

Table 1. *Patent applications in selected IT-related CPC classes, by applicant country and selected years, 2002-2022.*

Year	China	India	United States	Germany	Japan
G06F					
2021	16,050	833	45,476	3,278	9,149
2016	13,203	687	59,800	4,365	13,602
2011	4,141	1,218	40,970	3,419	11,442
2006	1,505	333	30,042	3,012	9,204
2001	155	21	22,104	2,349	6,096
G06Q					
2021	3,036	551	16,936	1,066	4,032
2016	2,371	529	23,467	1,332	3,306
2011	508	542	19,833	1,045	1,722
2006	298	87	13,580	1,031	1,814
2001	41	13	11,678	1,123	3,302

Note: Values represent the number of patent applications attributed to applicants from India, China, the United States, Germany, and Japan in selected years. Applications are identified using Cooperative Patent Classification (CPC) classes G06F and G06Q. G06F covers electric digital data processing, whereas G06Q covers data-processing systems or methods specially adapted for administrative, commercial, financial, managerial, supervisory, or forecasting purposes. These classes capture selected IT-related inventions but do not represent all software or IT innovation. Counts may be affected by cross-country differences in patenting incentives, legal systems, filing practices, market size, patent quality, and international patent-family coverage. Data source: European Patent Office (EPO) Worldwide Patent Statistical Database (PATSTAT).

with information on products, platforms, research output, investment, firm performance, infrastructure, and technology adoption. Nevertheless, the divergence between service-export specialization and patenting activity reinforces the analytical point that revealed comparative advantage and accumulated technological capability capture different dimensions of development.

When considered alongside this broader evidence, China's patenting activity is consistent with a capability structure increasingly embedded in domestic platforms, infrastructure, manufacturing networks, and industrial applications. Manufacturing may have provided demand for systems integration, automation, supply-chain coordination, cloud services, industrial software, and data-driven production (21), while large domestic platforms created additional opportunities for software and digital business-model development (18, 19, 22). Some Chinese platform and application firms have also expanded internationally (23), suggesting that these capabilities can also be deployed in international markets.

The relevant comparison is therefore not whether China has "caught up" with an Indian benchmark or whether one country possesses a uniformly stronger IT industry. China and India have accumulated different portfolios of IT capability. India has achieved exceptional strength in globally delivered IT services and human-capital-intensive business processes, while China has developed substantial capabilities in domestic platforms, software applications, digital infrastructure, systems integration, and manufacturing-linked digitalization. A dynamic industrial capabilities perspective focuses on how these different portfolios were accumulated, how they are being recombined, and how they may shape subsequent technological development, rather than ranking the two countries through a single measure of service-export comparative advantage.

HOW IT CAPABILITY STRUCTURES CONDITION AI DEVELOPMENT PATHWAYS

Recent international indicators reveal a notable contrast between India's human-capital endowment and the broader structure of its AI ecosystem. India rose rapidly in the Stanford Global AI Vibrancy ranking and possesses one of the world's largest pools of AI authors and inventors. Much of its index performance is associated with Talent and R&D. Nevertheless, as shown in Table 2, relative to the scale of its talent base, India records more limited frontier-model production, private AI investment, computing infrastructure, and selected formal innovation outputs. China displays a different configuration: despite a lower Talent sub-index score in 2024, it records substantially higher output in granted AI patents, notable models, infrastructure, and manufacturing-linked deployment. These observations do not establish a simple ranking of national AI capability. Instead, they identify a capability-conversion puzzle: why are substantial stocks of technical knowledge organized and transformed into different combinations of AI research, models, products, and applications?

Table 2. *Selected Measures across major dimensions of AI Ecosystem Development in China and India.*

Selected pillar	Selected measure	Year/Period	China	India	Source
R&D		2024	17.22	7.13	Stanford Global AI Vibrancy (24)
		2017	16.69	4.18	Stanford Global AI Vibrancy (24)
	Published GenAI patent families, number	2024-2025	43,383	929	WIPO (25)
		2014-2023	38,210	1,350	WIPO (25)
	Notable AI models, number	2025	35	0	Stanford AI Index Report 2026 (2)
		2017	9	0	Stanford Global AI Vibrancy (24)
Economy		2024	1.96	0.85	Stanford Global AI Vibrancy (24)
		2017	8.33	0.68	Stanford Global AI Vibrancy (24)
	Private AI investment, US $ billion	2013-2025	131.83	15.39	Stanford AI Index Report 2026 (2)
	Newly funded AI firms, number	2013-2025	1,766	542	Stanford AI Index Report 2026 (2)
	Industrial robot installations, number	2024	295,000	9,100	Stanford AI Index Report 2026 (2)

Continued Table 2 *Selected Measures across major dimensions of AI Ecosystem Development in China and India.*

Selected pillar	Selected measure	Year/Period	China	India	Source
Talent		2024	5.7	9.12	Stanford Global AI Vibrancy (24)
		2017	5.45	4.23	Stanford Global AI Vibrancy (24)
Infrastructure		2024	6.4	0.65	Stanford Global AI Vibrancy (24)
		2017	18.75	0.15	Stanford Global AI Vibrancy (24)
	Data centers, number	2025	449	153	Stanford AI Index Report 2026 (2)

Note: R&D, Economy, Talent, and Infrastructure are major pillars reported by the Stanford Global AI Vibrancy Tool. The selected measures listed beneath each pillar are used to illustrate related aspects of that dimension; they are not necessarily components of the corresponding Stanford pillar score. Notable-model production is included in the Stanford AI Index's Research and Development framework, whereas GenAI patent-family data are independently reported by the World Intellectual Property Organization (WIPO). The measures capture different dimensions of AI ecosystem development and are not directly additive. Notable-model counts refer to the curated Epoch AI dataset and are not a census of all national model development. Patent-family counts indicate formalized inventive activity but do not directly measure patent quality, commercialization, adoption, or industrial deployment.

The central argument of this section is that IT capability structures condition AI development through four interrelated mechanisms: the organizational allocation of technical talent, the ownership and control of products and data, the capacity to mobilize sustained R&D and computing resources, and the availability of domestic application and commercialization environments. These mechanisms influence whether technical knowledge is converted primarily into client-oriented services, proprietary models and platforms, or industrial applications.

India's service-led IT structure has organized a large share of its technical talent around internationally delivered software services, consulting, maintenance, systems integration, and project execution. Infosys explicitly described its Global Delivery Model as allocating work across locations according to talent availability, cost, risk, and client requirements (26), while TCS and Wipro similarly developed extensive cross-border systems for IT services, consulting, engineering, and business-process delivery (27, 28). These organizational models helped major Indian firms accumulate capabilities in coordinating complex projects, adapting technologies to client requirements, and managing globally distributed teams. Such capabilities are increasingly being extended into enterprise automation, cloud transformation, data-driven solutions, and AI-enabled services and platforms (26-28). Nevertheless, a business model centered primarily on external clients may generate different learning incentives from one centered on proprietary products or platforms. It may direct learning toward reliable delivery, customization, integration, and cost efficiency, while providing fewer opportunities for long-horizon model development, product ownership, and the internal accumulation of commercially controlled data. This does not imply that Indian firms remain confined to conventional outsourcing; rather, their movement into enterprise platforms and AI-enabled services reflects an ongoing recombination of service-delivery capabilities. China's platform- and manufacturing-linked IT structure developed through a different organizational setting. Alibaba, Tencent, and Baidu built proprietary platforms, products, and application ecosystems, while digital technologies became increasingly embedded in manufacturing, logistics, payments, cloud services, e-commerce, and supply-chain management (18, 19, 22). Alibaba reports an ecosystem connecting merchants, consumers, logistics services, cloud infrastructure, big-data tools, and AI capabilities (18); Tencent has framed part of its expansion in terms of the "Industrial Internet" (19); and Baidu has commercialized AI through cloud infrastructure, enterprise applications, and autonomous-driving services (22). These settings may provide more varied environments for proprietary R&D, model development, systems integration, and application-based learning, although their association with AI outcomes does not establish a causal effect.

The distinction is also visible in the organization and use of data. China's large platforms and industrial systems generate extensive consumer, transaction, logistics, and production data that may be integrated into digital products and sector-specific applications (21). The use of public-cloud large-model services has also expanded rapidly. According to the China Academy of Information and Communications Technology (CAICT), customer-facing use of public-cloud large models in China reached approximately 2 quadrillion tokens in 2025, while documented industrial applications spanned research and design, production and manufacturing, and operational management (21). India likewise possesses major digital public infrastructure, expanding domestic platforms, and substantial digital-payment and startup ecosystems (15, 17). An EY-NASSCOM analysis of 201 leading Indian B2B SaaS companies found that 99% of the firms in the sample used DeepTech in customer-oriented use cases. AI and machine learning accounted for 54% of the DeepTech use cases identified, followed by big data and descriptive analytics at 39% and intelligent automation at 7% (16). Most of these applications addressed horizontal enterprise functions, particularly sales and marketing, human resources, and operations and supply-chain management (16). The relevant contrast is therefore not that China has data whereas India does not. Rather, it concerns the organizational environments in which data are generated and AI capabilities are applied and the extent to which they can be integrated with proprietary products, research systems, and industrial applications. India's service and SaaS firms often deploy AI within client-controlled systems and data, whereas China's platform and manufacturing-linked systems provide additional settings for integrating AI into domestic consumer applications, logistics systems, production processes, and broader industrial applications.

Recent evidence is consistent with these different capability-conversion structures. Patent-family data indicate a much larger accumulated stock of generative-AI invention in China, while also showing rapid growth in India from a smaller base. Likewise, the large gap in notable-model production is consistent with differences in frontier-model development capacity. However, neither patent counts nor model counts directly measure the commercialization, adoption, or industrial deployment of AI. The fact that industry produced more than 90% of notable models in 2025 instead suggests that frontier-model development depends heavily on firms capable of combining talent with sustained R&D, compute, data, and product-development capacity (2). Table 2 therefore presents multiple indicators—including talent, patent families, models, investment, infrastructure, and industrial deployment—rather than treating any single measure as evidence of overall AI capability.

These differences may influence the sectors in which AI is most readily commercialized. China's AI trajectory is closely associated with domestic platforms, industrial automation, robotics, logistics, payments, and manufacturing applications. India's trajectory is more closely associated with AI-enabled software services, consulting, enterprise integration, digital public infrastructure, and the transformation of the IT-BPO sector. This does not imply that either pathway is fixed or exclusive. India's expanding startup ecosystem, software-product firms, public digital infrastructure, and emerging AI initiatives may create new channels for proprietary products, domestic applications, and higher-value AI services. At the same time, generative AI presents both opportunities and adjustment pressures for India's service-led model. It may increase demand for AI integration, consulting, data engineering, cybersecurity, and digital transformation, while reducing labor demand for some routine coding, testing, maintenance, customer-support, and back-office tasks. The relevant structural question is therefore not whether India's outsourcing model has failed, but whether its accumulated human capital and service-delivery capabilities can be recombined into proprietary products, platforms, models, and domestic applications.

Overall, the evidence is consistent with the proposition that different IT capability structures condition different AI development pathways. China's platform- and manufacturing-linked structure appears to provide more channels for proprietary model development and industrial deployment, whereas India's service-led structure has generated strong human-capital and organizational capabilities that are especially suited to AI-enabled services and enterprise transformation. These interpretations remain provisional. State policy, research funding, access to capital and advanced computing hardware, regulation, trade restrictions, and patenting incentives may also contribute to the observed differences.

CONCLUSION

This paper reexamines the familiar characterization of global production as "Made in China and Coded in India" through a dynamic industrial capabilities perspective. Although the phrase captures important differences in export specialization, it does not fully represent the technological and organizational capabilities accumulated in the two economies. India developed globally competitive strengths in software services, IT outsourcing, project delivery, and human capital, whereas China accumulated substantial capabilities in manufacturing-linked digitalization, domestic platforms, cloud services, systems integration, and industrial applications. The comparison therefore concerns different capability configurations rather than a simple ranking of national IT strength.

These differences may condition how AI capabilities are developed and commercialized. India's service-led IT structure has generated valuable expertise in software engineering, consulting, process management, and globally coordinated service delivery, creating opportunities in AI integration and enterprise transformation. China's platform- and manufacturing-linked structure appears to provide more extensive channels for proprietary model development, data-intensive applications, and industrial deployment. These patterns are consistent with the proposition that accumulated IT capability structures influence how AI-related resources are combined and converted into research, products, platforms, and applications.

The evidence does not establish that China's manufacturing-centered path caused its later IT and AI capabilities or that India's outsourcing model caused weaker domestic AI outcomes. The observed differences may also reflect research funding, state policy, capital availability, computing infrastructure, access to advanced hardware, regulation, trade restrictions, and patenting behavior. Patent and model counts capture only selected dimensions of technological capability and should be interpreted alongside evidence on research quality, investment, firm performance, infrastructure, commercialization, and adoption.

The broader implication is that current comparative advantage provides only a partial account of future technological competitiveness. Different forms of global integration may generate different organizational routines, learning mechanisms, market linkages, and complementary assets, thereby conditioning how existing capabilities are extended into new technological domains. The paper therefore contributes a capability-conversion perspective linking historical patterns of specialization to the organizational and industrial conditions under which emerging technologies are developed, commercialized, and deployed. These pathways are not fixed: India's expanding startup ecosystem, digital public infrastructure, software-product firms, and AI initiatives may support movement beyond traditional outsourcing, while China's development also faces constraints related to patent quality, advanced computing hardware, regulation, and uneven commercialization. Future comparative research should examine how service-led and manufacturing-linked capability structures are recombined under generative AI using patent-quality measures, firm-level innovation and productivity data, AI investment and computing-capacity indicators, and domestic adoption evidence.

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CONFLICT OF INTEREST

The author declares that there are no conflicts of interest related to this work.

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