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Penetrating Insights

CONTENTS

AT&S and Chongqing's Joint Path Toward AI-Driven, Sustainable Manufacturing

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Introduction:

As China advances toward intelligent, high-quality manufacturing, Chongqing is emerging as a strategic center of gravity. Located at the intersection of the Belt and Road Initiative and the Yangtze River Economic Belt, Chongqing is uniquely positioned to serve as a logistics hub and industrial innovation base. Its role in the Chengdu–Chongqing Economic Circle [1]strengthens its capacity to drive western development and rebalance economic concentration toward inland provinces.

Central to Chongqing's growth strategy is the integration of artificial intelligence into industrial operations—a vision laid out in the municipal government's "AI + Manufacturing" plan. The "33618" model [2]outlines the development of 30 smart factories, 300 digital workshops, and multiple advanced industrial clusters by 2027. These targets reflect a deep policy commitment to intelligent production, digital trade, and sustainable industry.

Chongqing's transformation aligns with China's national priorities under the "dual circulation[3]" strategy, which seeks to build domestic resilience while remaining globally integrated. AI is considered foundational infrastructure, not merely a tool, powering automation, decision-making, and innovation across sectors.

For global leaders like AT&S, this convergence presents a rare opportunity. AT&S's Chongqing facility is a cornerstone of its global footprint, manufacturing high-density IC substrates used in AI chips, servers, and smart systems worldwide. These substrates enable faster, more efficient data transmission and computation, capabilities essential to AI-enabled manufacturing.

This white paper explores how Chongqing's strategic policy direction and AT&S's innovations in sustainable manufacturing can be jointly leveraged to create a smart, sustainable, and globally competitive manufacturing ecosystem.

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[1] *https://en.planning.org.cn/planning/view?id=1293*

[2] *https://app.ichongqing.info/mixmedia/a/202402/20/WS65d418b2e4b075523e30a873.html*

[3] *https://en.wikipedia.org/wiki/Dual_circulation*

Chapter 1: Chongqing's Strategic Push Toward Smart Manufacturing

In recent years, Chongqing has rapidly scaled up efforts to transform itself into a high-value manufacturing hub powered by artificial intelligence. The city's "Action Plan for High-Quality Development of Digital Trade and Services"[4] sets clear and ambitious targets, including:

- Establishing 30 smart factories and 300 digital workshops by 2027.
- Advancing six industrial clusters in key sectors.
- Building a national demonstration zone for smart manufacturing.
- Accelerating the integration of AI across electronics, automotive, equipment, and materials sectors.

These initiatives are designed to position Chongqing as a flagship city in China's national "AI Plus" campaign[5], which emphasizes the widespread deployment of AI in real-economy sectors. The strategy reflects a shift from "automation" to "intelligence", embedding machine learning, real-time analytics, and predictive control into the core of production processes. Chongqing's policy design includes both top-down coordination and bottom-up experimentation. Multi-department working groups guide the integration of AI in industrial parks, while pilot programs test digital twin technologies, predictive maintenance, and intelligent quality control systems.

One notable area of focus is embedded intelligence in factory settings. This includes the use of AI-powered sensors and real-time monitoring tools to improve efficiency, reduce downtime, and enhance safety. In addition, the city is fostering development of embodied AI systems such as collaborative robots (cobots), automated guided vehicles (AGVs), and intelligent logistics platforms.

Infrastructure development has kept pace with policy ambition. Chongqing is investing heavily in 5G networks, industrial internet platforms, cloud computing hubs, and edge computing frameworks, all critical enablers of smart manufacturing. Strategic zones such as the Liangjiang New Area and Western Science City are serving as living labs for these technologies.

Together, these initiatives underscore Chongqing's determination to lead not only regionally but nationally in industrial digitalization. The city's comprehensive approach, combining infrastructure, incentives, pilot projects, and ecosystem building, provides fertile ground for strategic collaboration with global technology leaders like AT&S.

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[4] *https://www.webull.com/news/12891286778733568*

[5] *https://www.chinadaily.com.cn/a/202506/14/WS684cd3ffa310a04af22c639e.html*

Chapter 2: Challenges and Risks in AI-Enabled Industrial Transformation

Chongqing's roadmap for AI-enabled industrial transformation is ambitious, forward-looking, and aligned with broader national priorities. However, the road to implementation is neither simple nor linear. Unlocking the full value of artificial intelligence across the manufacturing sector will require overcoming a set of complex, interrelated challenges that go beyond technology alone. These challenges touch on infrastructure, skills, governance, and global dynamics—and addressing them will demand both sustained investment and coordinated action across public and private sectors.

One of the most immediate barriers to AI adoption lies in the technological fragmentation of existing industrial environments and the prevalence of legacy systems. Many traditional factories in Chongqing, and across China more broadly, still operate with older-generation equipment that lacks digital interfaces, remote connectivity, or real-time monitoring capabilities. These legacy systems were never designed with AI in mind, and as a result, they present significant integration challenges. AI applications typically require standardized and interoperable platforms to function effectively—yet the diversity of machinery, proprietary software, and non-compatible communication protocols creates a highly fragmented environment. Retrofitting older facilities to become AI-ready often entails complex engineering, disruption of production, and significant upfront investment. For small and medium-sized enterprises (SMEs) operating with constrained resources, these barriers can be prohibitive. Without targeted support for modernization and system integration, the promise of AI may remain inaccessible for large segments of the industrial base.

In parallel, many manufacturing zones still face gaps in digital infrastructure and rising cybersecurity risks. The successful deployment of industrial AI depends on secure, low-latency connectivity, seamless data transmission, and scalable computing capacity—requirements that many facilities do not yet meet. Critical elements such as edge computing capabilities, industrial cloud platforms, and real-time data exchange systems remain underdeveloped in some regions. The expansion of digital infrastructure is essential, but it also brings increased exposure to cyber threats. Smart factories operating with interconnected systems are particularly vulnerable to risks such as malware infiltration, ransomware attacks, intellectual property theft, and even nation-state cyber espionage. The stakes are even higher when AI models are involved, as corrupted training data or unauthorized access to algorithms can compromise system integrity at scale. In many cases, the absence of clearly defined industrial cybersecurity standards—and limited awareness of digital risk management—exacerbates these vulnerabilities and reduces the confidence of manufacturers to invest in smart solutions.

A third, and often underappreciated, challenge is the growing shortage of skilled talent needed to support AI-enabled transformation. The shift to intelligent manufacturing introduces entirely new job categories—ranging from data engineers and machine learning integrators to automation software developers and robotics maintenance specialists. However, the supply of qualified talent in these domains has not kept pace with demand. Many workers in traditional manufacturing roles have little exposure to digital tools, while engineering graduates often

lack practical experience in industrial settings. This mismatch between labor market supply and demand creates a structural skills gap that cannot be addressed through recruitment alone. A Vocational and higher education systems will need to evolve accordingly—modernizing curricula, incorporating dual-training models that combine classroom instruction with hands-on industry training, and deepening partnerships between academic institutions and manufacturers. Without such reforms, workforce constraints may become a critical bottleneck in the transformation process.

Chongqing's industrial transformation is also exposed to supply chain and geopolitical volatility, which can delay or disrupt AI adoption efforts. The availability of high-performance substrates, AI chips, embedded computing modules, and precision automation components is increasingly shaped by global supply dynamics. Events such as semiconductor shortages, export restrictions, raw material price swings, and logistics disruptions can all interfere with production timelines and investment planning. For multinational companies, the complexity is compounded by the need to navigate a shifting landscape of trade regulations, technology transfer limitations, and localization requirements. As AI hardware becomes a strategic asset, the ability to secure reliable, diversified supply chains becomes essential not only for operational continuity but also for national industrial resilience. This is particularly relevant in the context of AI infrastructure, where specialized components are often sourced globally but must be integrated locally.

Finally, regulatory fragmentation and policy uncertainty represent systemic obstacles to scaling AI in manufacturing. While national-level strategies such as AI development roadmaps provide important top-down direction, regional disparities in implementation and the absence of harmonized standards can undermine coherence. Policies governing data localization, cross-border data sharing, and intellectual property protection are especially important for international collaboration and foreign direct investment. Inconsistent enforcement or unclear administrative processes can discourage both domestic and foreign players from making long-term commitments to AI adoption. Moreover, the lack of a unified industrial AI governance framework—one that integrates technical, ethical, and commercial considerations—can create hesitation around scaling experimental deployments into full production environments.

Taken together, these challenges underscore the need for a systems-level approach to AI-enabled industrial transformation. Technological advancement alone will not be sufficient. Progress will depend on the alignment of multiple enabling factors—robust infrastructure, strong cybersecurity, workforce readiness, secure supply chains, and consistent policy frameworks. Addressing these gaps will require coordination across stakeholders, from government ministries and regional authorities to educational institutions, industry leaders, and technology providers. In this broader context, Chongqing has the opportunity to become not only a beneficiary of AI, but also a national model for how to implement it responsibly, inclusively, and at scale.

Chapter 3: The Role of Government in Enabling Smart, Sustainable Manufacturing

The Role of Government in Enabling Smart, Sustainable Manufacturing Chongqing's ambition to become a national and global leader in smart, sustainable manufacturing is bold and well-aligned with China's broader industrial transformation goals. However, achieving this vision requires more than technological readiness or enterprise innovation—it demands an active and enabling role from the government. Public policy must not only keep pace with technological change but also anticipate the systemic needs of a digitally integrated, AI-driven industrial future. Proactive leadership, strategic investment, and ecosystem coordination by government bodies at all levels will be critical in shaping an environment where innovation thrives, sustainability is prioritized, and global competitiveness is secured.

One of the most fundamental roles government can play is investing in foundational infrastructure. Smart manufacturing requires robust digital and physical infrastructure that can support real-time connectivity, high-volume data processing, and seamless integration across industrial systems. Public investment in regional data centers, edge–cloud computing platforms, and open-access AI testbeds can democratize access to advanced capabilities. These shared platforms are particularly important for small and medium-sized enterprises (SMEs), which often lack the resources to independently develop or deploy digital solutions. By reducing entry barriers, governments can ensure that the benefits of industrial AI are accessible to a broader swath of the manufacturing base, not just large enterprises. Targeted subsidies for digital retrofitting—such as upgrading legacy machinery with IoT sensors or integrating AI-driven analytics into production workflows—can further accelerate adoption among resource-constrained firms. AT&S, with its experience in modular, scalable smart manufacturing systems, stands ready to share best practices and provide replicable reference models that can be adopted across Chongqing's diverse industrial clusters.

As digitalization advances, cybersecurity and data governance become increasingly critical for industrial resilience and trust. Government leadership is essential in setting cybersecurity standards tailored to the realities of smart factories, where cyber-physical systems must be protected against a growing array of threats. Regulatory frameworks that facilitate the secure exchange of threat intelligence, mandate secure-by-design practices in industrial software and hardware, and establish rapid response mechanisms will be crucial. Equally important is the development of clear, transparent policies on data ownership, use, storage, and cross-border data flows. For multinational companies like AT&S operating in sensitive and highly regulated industries, data compliance and digital safety are essential. The company can leverage its global experience in data protection and regulatory adherence to support capacity-building efforts in Chongqing—helping local partners align with international best practices and strengthening the region's overall cybersecurity posture.

Another critical dimension of enabling smart manufacturing is workforce development. The transition to AI-driven, automated production systems will fundamentally reshape the nature of industrial work. Traditional roles will evolve, and new roles will emerge that require interdisciplinary skills spanning engineering, data sci-

ence, and system integration. To prepare for this shift, governments must take the lead in building a future-ready workforce through sustained investment in education and training. Public-private partnerships can accelerate the rollout of dual vocational training programs, industry-linked university curricula, and applied research centers focused on intelligent manufacturing. These initiatives not only bridge the skills gap but also foster a culture of lifelong learning and innovation. AT&S is committed to playing an active role in this area. The company already supports technical training, internships, and educational collaboration at its Chongqing site, and stands ready to co-develop training modules and joint programs that align with both local talent needs and global technology trends.

Establishing the optimal conditions for smart manufacturing also requires a robust innovation ecosystem—one that supports the full journey from R&D to commercialization. Here, the government has a catalytic role to play. Strategic funding of research in industrial AI, robotics, and smart sensing technologies can spur early-stage breakthroughs. At the same time, policies that protect intellectual property, simplify technology transfer procedures, and connect academic research with industrial applications are key to turning prototypes into products. Incubation programs, innovation vouchers, and competitive industrial challenges can encourage startups and individual researchers to develop and scale next-generation solutions. Facilities like AT&S's Chongqing site can function as real-world testbeds for these innovations—providing a platform for pilot projects, joint development, and scalable deployment of AI-enabled manufacturing systems. By bridging the gap between lab and line, these initiatives accelerate time to market and reduce innovation risk.

Finally, the foundation for all these efforts is a stable, transparent, and forward-looking policy environment. Long-term investor confidence depends on more than incentives—it requires predictability in regulation, fairness in enforcement, and efficiency in administrative processes. In a field as complex and fast-moving as smart manufacturing, clarity in digital, environmental, and industrial policy is essential. Governments can support strategic investment by offering structured benefits such as ensuring companies have easy access to green energy at reasonable cost, streamlined approvals for factory upgrades, and priority access to infrastructure for digital transformation projects. The ability to signal long-term policy direction—particularly in areas like carbon neutrality, AI governance, and cross-sector data integration—will help cities like Chongqing distinguish themselves on the global stage. For multinational players like AT&S, such clarity and consistency are not just attractive— they are crucial determinants in future investment decisions.

In summary, the path to smart, sustainable manufacturing in Chongqing is a shared journey—one that depends not only on enterprise innovation but on visionary public leadership. By investing in digital infrastructure, safeguarding industrial data, developing future skills, nurturing innovation, and offering a predictable policy framework, the government can create fertile ground for industrial transformation. In return, global partners like AT&S can amplify these efforts through technology transfer, local engagement, and long-term commitment.

Chapter 4: AT&S's Role and Strategic Contribution

AT&S is a recognized global leader in IC substrates and advanced interconnect solutions—core technologies that form the foundation of artificial intelligence infrastructure. From data centers and cloud computing platforms to edge devices and autonomous systems, the company's high-end products are critical enablers of high-speed, high-density data processing. AT&S's technologies not only support the computational performance required by AI workloads but also address increasingly complex design and integration challenges faced by the semiconductor industry.

In China, AT&S's Chongqing facility stands out as one of the most advanced substrate manufacturing sites in the world. Specializing in high-end applications, this site produces FC-CSP and ABF substrates for AI chips deployed in servers, intelligent networking equipment, and high-performance control systems. The facility reflects the company's commitment to technological excellence, precision engineering, and local value creation. As one of the few facilities in the world capable of producing these highly complex substrates at scale, the Chongqing site plays a critical role in meeting global demand for next-generation computing power.

AT&S's contribution to China's AI-driven transformation extends well beyond manufacturing. The company brings a deep global innovation network, with R&D centers in both Austria and China. These centers collaborate across borders on frontier topics such as advanced materials, ultra-fine line technology, and substrate-level integration of sensors and circuits. In particular, the company's Chinese R&D efforts are increasingly focused on applications that align with the country's emerging needs in edge computing, industrial automation, and intelligent mobility. By combining global expertise with local responsiveness, AT&S is not only adapting to technological change, it is helping to lead it.

Sustainability is another key area where AT&S adds value. As one of the first advanced manufacturers in the region to implement comprehensive green production systems, the Chongqing facility incorporates renewable energy sources, carbon-reduction strategies, and waste minimization technologies throughout its operations. These efforts support both AT&S's global climate goals and Chongqing's ambition to become a low-carbon industrial city. In doing so, AT&S demonstrates that economic growth, technological leadership, and environmental responsibility can, and must, go hand in hand.

Operationally, AT&S draws upon decades of experience in industries where quality, reliability, and safety are essential—such as AI devices, automotive and data center. This background informs its approach to precision manufacturing for AI applications, where consistent performance and robust quality control are essential. From thermal performance to signal integrity, every AT&S product is built to meet the highest international standards, ensuring that AI systems can operate reliably in the most demanding environments.

AT&S is also deeply committed to developing local talent. The company offers a range of technical training programs, apprenticeships, and internships that equip students and young professionals with the skills needed for

future-ready manufacturing. It works closely with vocational schools, universities, and government agencies to ensure that workforce development aligns with technological advancement. By investing in people as well as processes, AT&S helps establish the human foundation for sustainable industrial growth.

In addition to its work on the factory floor and in classrooms, AT&S takes part in policy discussions and industrial development forums at both local and national levels. It brings a unique perspective as a multinational investor with deep technical expertise, contributing to conversations on digital transformation, intelligent manufacturing, and environmental governance. These engagements help align AT&S's innovation agenda with the long-term goals of Chongqing and China as a whole.

As an anchor enterprise in Chongqing's emerging smart manufacturing landscape, AT&S exemplifies how foreign investment can create meaningful local value. The company brings not only cutting-edge technologies, but also a collaborative spirit, a commitment to sustainability, and a proven model of global-local integration. In doing so, AT&S supports China's broader strategic objectives—from building advanced digital infrastructure to fostering a resilient, innovation-driven economy.

Conclusion: Enabling the Future Through Innovation and Partnership

As the global economy enters an era defined by intelligent, sustainable manufacturing, Chongqing has a unique opportunity to lead. Backed by strategic policy, expanding infrastructure, and a collaborative mindset, the city is poised to set a benchmark for AI-powered industrial transformation.

AT&S is proud to be a long-term partner in this journey—contributing cutting-edge technologies, global experience, and deep local engagement. Together, Chongqing and AT&S can create a thriving model of public-private innovation—integrating economic strength, technological advancement, and sustainability.

Through continued alignment of policy, innovation, and collaboration, we can not only shape the future of manufacturing in China, but also set a global example of how to build smarter, greener, and more inclusive industries.

Advancing Smartification of Chongqing's Auto Parts Industry Through "AI + Manufacturing"

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Abstract

Manufacturing is the backbone of a nation's economy and also a cornerstone of global competitiveness. As China vigorously promotes high-quality development in manufacturing, Chongqing, one of the country's leading industrial cities, has adopted the "33618" modern industrial cluster framework, designating smart new energy vehicles (NEVs) as one of its three pillar industries. The city is committed to building a world-class industrial cluster and establishing itself as a global hub for smart NEVs.

With the rapid evolution of the global auto industry, the focus of competition has shifted from scale expansion to advancement in smartification and full value chain optimization. Chongqing's automotive sector is aligning with this trend, undergoing a structural transformation from scale leadership to value-driven growth. Accelerating the concentration and upgrading of automotive parts industry through policy guidance has become a key strategic enabler in strengthening Chongqing's industrial advantages.

We believe AI will play a pivotal role in empowering smart manufacturing of auto parts and driving agility and digital transformation. On one hand, AI can enable flexible production to meet market demand for "smaller volume, more programs, and fast pace". It can also optimize operational processes and enhance manufacturing stability, delivering improvements in both quality and efficiency. On the other hand, AI technologies can empower engineering process optimization and product innovation, increase agility and shorten development cycle, thereby enhancing product competitiveness and cost-effectiveness.

As a global leader in the automotive seating industry, Adient has extensive experience in auto parts engineering and manufacturing worldwide. With Chongqing as a strategic base for our China operations, we have developed deep understanding and insights of the local automotive landscape. We hope to leverage our industry expertise and leading practices to provide meaningful recommendations and support the smartification of Chongqing's auto parts sector, with focus on fostering innovation eco-system, accelerating new technologies adoption and enhancing global impact.

Chapter 1: Overview of China and Chongqing's Auto Industry Trends and Opportunities & Challenges for Auto Parts Industry

In recent years, China's automotive industry has gone through unprecedented transformation and while steadily growing in scale. In 2024, China's passenger car production and sales ranked first in the world for the 16th consecutive year, reaching 27.48 million and 22.89 million units respectively. With the well-established supply chain, infrastructure, and policy guidance empowering auto companies to innovate, China's automotive industry has shifted focus from volume to value and quality, setting the trend of electrification and smartification in the global automotive sector.

In terms of electrification, the penetration rate of EVs in China increased from less than 5% in 2018 to 48%[1] in 2024. In the first half of 2025, the EV penetration rate in 12 key provinces exceeded 50%. In terms of smartification, with the regulations and infrastructure in place, China's autonomous driving and smart cabin technology continues to make breakthroughs. In 2025, the penetration rate of L2 in new car sales exceeded 50%[2]. In the field of high-level ADAS, China is also leading the technology and commercialization through cost reduction of LiDAR, implementation of NOA urban scenarios, and the collaborative integration of vehicle-road-cloud ecosystems.

Amidst this industry transformation, Chongqing, as the largest and most important automotive manufacturing center in western China, has focused on the "33618" modern manufacturing cluster strategy in recent years. By highlighting smart NEVs as a trillion-yuan leading industry, Chongqing has been promoting the upgrading of "Vehicle + Parts" manufacturing and achieved major breakthroughs in "product upgrading, brand upgrading, and value chain upgrading." In 2024, Chongqing's automobile production reached 2.54 million units, a YoY increase of 9.4%, including 953,000 NEVs with 90.5% YoY growth, significantly outperforming the national growth rate by nearly 60%[3]. The "Chongqing World-Class Intelligent and Connected New Energy Vehicle Industry Cluster Development Plan (2022-2030)" has provided strategic direction for Chongqing's automotive industry and strong policy support for auto parts companies, including Adient.

Rooted in the world's largest automotive market, Adient has been operating in China for nearly 30 years, growing together with both international brands and local Chinese automakers. Through footprint coverage in all major auto bases in China, rapid and agile product engineering, and synergies with our global resources, Adient continues to enhance its competitiveness, winning customer trust with leading innovations and excellent delivery quality.

Chongqing holds a strategic significance for Adient in China. Over the years, Adient has continuously in-

[1] *China Passenger Car Association (CPCA)*

[2] *China Committee of Electric Vehicles 100 Members*

[3] *Official website of Chongqing City Municipal Government*

creased its investment and deeply integrated into the local economy. Since the establishment of our joint venture in Chongqing in 2003, Adient has been leveraging Chongqing as the engineering and manufacturing center to drive business growth in China and drive innovations globally. By 2024, Adient had invested over 1 billion yuan in Chongqing. In 2015, Adient expanded beyond HMP plant by building Yufu plant. In early 2022, Adient China fully acquired its joint venture in Chongqing and used it as a platform for further investment - acquiring the headrest business from Boxun Industrial and establishing a joint venture with Xiamen Jinbo in Chongqing to produce innovative seating products such as mechanical massage. These moves have further expanded Adient's product portfolio and supported the upgrade of Chongqing's auto parts industry. In February 2025, Adient completed the expansion and upgrade of the China Tech Center in Chongqing, which showcases the achievements of our product innovations and new technologies, and our leadership in the global transition of electrification and smartification.

As competition in China's automotive industry becomes increasingly fierce for both product content and pricing, automakers are accelerating the launch of innovative products, continuously shortening development cycles, and placing higher requirement on the smartification and agility of the supply chain. This drives auto suppliers to deeply participate in joint development with automakers and provide modular and flexible solutions. At the same time, the price pressure across the auto industry is also transferred to the supply chain, requiring cost competitiveness while achieving fast and high-quality delivery.

As a global leader in automotive seating, Adient is committed to achieving the best balance between product innovation, high-quality delivery, agile service, and cost efficiency through the development and application of smart and automated technologies. In the future, Adient will continue to invest in product innovation, smart manufacturing, AI applications, and supply chain capability in Chongqing to meet the future needs of the China and global markets and lead the development of the auto parts industry.

Chapter 2: Leveraging AI in Manufacturing Process to Advance Digital Transformation

In the new era of smart manufacturing for automotive parts industry, Adient China continues to lead industry upgrading with forward-looking vision and innovative practices. Leveraging Chongqing as a key strategic base, Adient's AI-driven smart manufacturing system continuously breaks through technological boundaries, becoming a core engine driving the digital upgrade and automation transformation of the auto parts industry. Adient's Chongqing footprint has not only achieved outstanding results in key areas such as automation, digitalization, and AI empowerment but has also shared the practices globally, reinforcing Adient's leading position in smart manufacturing.

2.1 Build an AI-driven Smart Manufacturing Hub and Set Industry Benchmark

Through introducing advanced automation equipment, industrial IoT, and 5G technology, Adient has estab-

lished a highly intelligent production monitoring and management system at our footprint in China: sensors on the production line collect data in real-time and upload it to the central control system, where AI performs analysis to predict equipment status and automatically schedule maintenance plans, significantly reducing downtime losses and improving production efficiency. In key processes such as frame welding, AI optimizes welding process, enhancing precision and significantly reducing defect rates.

The accumulation and iteration of manufacturing databases lay a solid foundation for the continuous improvement and quality stability in the entire seating manufacturing process. Leveraging the successful experience of our Chongqing plant, Adient China has not only become a benchmark for smart upgrades of parts manufacturing in China but has also provided replicable and deployable smart manufacturing practices for Adient's plants located in other regions.

2.2 Drive Collaborative Innovation of Automated Logistics, Robotics, and Digital Supply Chain

In the field of automated logistics and production, China's automotive parts industry continues to achieve innovative breakthroughs. At Adient's plants in China, smart logistics equipment such as AGVs and AMRs operate in production and material areas, efficiently conducting parts transfer, automatic replenishment, and finished product stacking, significantly improving process efficiency. Additionally, the introduction of automatic sewing technology has revitalized the labor-intensive seat cover sewing process, significantly enhancing production automation level. Furthermore, humanoid robots in seat assembly, foaming process, and metal welding demonstrate strong multi-scenario adaptability and continuous evolution capabilities, thanks to cloud-based rapid learning capabilities, not only improving production safety and consistency but also driving manufacturing processes towards automation and flexibility to meet market demand for "smaller volume, more programs, and fast pace".

In Chongqing, Adient is actively building a digital supply chain platform to dynamically respond to market changes and optimize inventory and logistics resources. By sharing data with suppliers, Adient achieves efficient coordination and precise material scheduling. With focus on supply chain collaborative innovation, Adient has set a benchmark for smart supply chain in China's automotive parts industry, and its digital capabilities are being extended to our global plant network.

2.3 Lead in Quality Control through AI Vision and Generative AI Innovation

Adient is committed to integrating cutting-edge technologies such as AI vision and generative AI into various aspects of automotive seat manufacturing. Leveraging advanced practices led by our plant in Chongqing, AI vision systems have been adopted in seat inspection, frame stamping and welding, and seat cover sewing. These systems enable efficient defect identification, automatic guidance of complex operations, and high product consistency, achieving smart upgrades of quality control in the full process. Meanwhile, Adient maintains rigorous data security protocols, including data encryption storage, access permissions, and security audit, building a data security

firewall for AI empowerment.

Adient China's smart quality control initiatives provide practical examples for Adient's global digital upgrade, continuously strengthening Adient's leadership position in the automotive parts manufacturing sector.

Chapter 3: Promoting AI in Engineering Development to Drive Product Innovation for Smart EVs

Chongqing is developing into a global hub for smart technology in auto industry by leveraging its industrial cluster and advantages as the "City of Design." Adient, with our China TC located in Chongqing, continues to develop and promote the application of AI technology in engineering processes, injecting new momentum into our business growth in China and contributing to the upgrade of Chongqing's automotive parts industry.

3.1 Reshape Automotive Seating Engineering Process for Efficiency

According to data from the Ministry of Industry and Information Technology in 2023, through the adoption of smart technology, China's manufacturing industry has achieved: 20% reduction in R&D cycle, 35% increase in production efficiency, 27% decrease in product defect rate, and 21% reduction in carbon emissions[4]. With the continuous evolution of AI technology, the auto parts manufacturing industry, including seating, is ushering in unprecedented opportunities for transformation.

The traditional seating development model now faces new challenges in terms of response speed, cost-effectiveness, and design iteration. Adient China is taking the lead in applying generative AI technology in seating engineering, which can quickly generate diverse innovative design solutions to meet differentiated market demands, while significantly improving product comfort and R&D efficiency. Here we want to share a few successful cases of AI applications in seating engineering process:

- **Smart Design of Seat and Seat Component** (a four-step closed-loop process): 1) Data Integration: Integrating A-surface data, foam parameters, and other component information; 2) Feature Processing: Screening key design variables through data cleaning and feature extraction; 3) Intelligent Optimization: Generating parameters based on deep learning models; 4) Output: Delivering feasible engineering solutions to achieve efficiency improvement, cost optimization, and performance enhancement.

- **Seat Industrial Design** (a three-stage innovation process): 1) Selecting a specific parametric model; 2) Real-time output of highly original renderings through design requirement prompts and reference image input; 3) Optimization: Fine-tuning headrest surface parameters and visual editing of stitching density.

[4] *China State Council Press Conference, January 19, 2024*

3.2 Accelerate Innovation of Smart Seating Products with AI empowerment

Vehicles are now shifting from traditional means of transportation to mobile living spaces. As the most direct and frequent interface in human-vehicle interaction, AI-enabled smart seats have become a key battleground for automakers to differentiate themselves. According to Roland Berger, the global smart seating market size will exceed $20 billion in 2025, with the China market accounting for more than 30%[5]. The latest New Vehicle Purchase Intention Study (NVIS) by J.D. Power shows that 71% of potential car buyers in China are highly interested in "interactive and smart seating features."[6]

Facing this market opportunity, Adient has highlighted connectivity as one of the five major directions for product innovation. Guided by emerging scenarios and end-user needs, Adient develops new smart seat functions and collaborates with automakers to accelerate mass production of multiple AI-enabled seating technologies, such as smart seats that actively perceive users' needs, seat position recommendations based on personalized preferences, adaptive adjustment functions, massage control modules, and long rail control modules.

The smart seating system can achieve personalized comfort adjustments by integrating hardware parameters and AI decision-making. The system recommends the optimal position (including slide rail, seat height, backrest angle, etc.) based on real-time biometric data and provides support adjustments for the body (such as headrest, neck rest, shoulder support, lumbar support, armrest, seat cushion, and leg support). In dynamic driving scenarios, the system can achieve adaptive adjustments such as lateral support and posture maintenance during acceleration and deceleration. Additionally, it offers hardness and posture adjustments for long-distance driving, and links functions such as massage, ventilation, heating, and ambient lighting to provide fatigue relief.

Adient's Smart Comfort System (SCS) Cabin developed in Chongqing integrates visual recognition systems (cameras) and pressure sensors to accurately obtain key biometric parameters such as the height and weight of drivers and passengers. Through the collaborative analysis of preset AI algorithms and ergonomic databases, it automatically provides seat position recommendations and angle/support adjustments. The system can also automatically activate functions based on the vehicle's driving mode (e.g., autonomous driving, meeting mode, resting mode), such as mechanical massage, zero-gravity posture adjustment, one-click from bed to seat, and 180° rotation, creating outstanding smart comfort experience for end users.

Adient China has also developed a series of complete seat smart control modules and key component control modules, such as electric long rail control module and mechanical massage control module, providing core technology for smart adjustment of seat systems.

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[5] *Roland Berger <Global Automotive Interior Trends 2024>*

[6] *J.D. Power <2025 China New Energy Vehicle Apeal Index Study (NEV-APEAL)>*

3.3 Bridge Collaboration in Product Innovation between Industry and Academia

In terms of talent and capability development, Adient China TC implements a deep integration strategy between industry and academia: on one hand, our engineering team closely cooperate with universities to develop well-round talents with both engineering capabilities and AI technical literacy, continuously strengthening the competitiveness of Adient's Tech Centers; on the other hand, we collaborate with top tier suppliers to build full-chain capabilities from algorithm development to engineering application.

At the same time, Adient China, in conjunction with universities and strategic suppliers, jointly develops AI application software for the design and engineering of seating products for smart EVs. Through continuous iteration, these tools are aligned with rapidly evolving market demands and technological trends.

Chapter 4: Recommendations for Chongqing's Auto Parts Industry

The global automotive industry is at a critical stage of transformation from "electrification" to "smartification," and Chongqing should seize the historic opportunity in smart EV industry to cultivate a leading and advanced auto manufacturing cluster and establish itself as the globally competitive automotive industry highland.

With considerations of Chongqing's solid foundation and resource advantages in the automotive industry, we would like to propose the following recommendations with focus on fostering innovation eco-system, accelerating adoption of new technologies and enhancing global impact. Adient looks forward to deepening cooperation with the Chongqing municipal government to support the local automotive parts industry move towards a new stage of high-quality growth and inject strong momentum into the local economic development.

4.1 Improve the Innovation Ecosystem of Smart EVs in Chongqing

Actively build an ecosystem and innovation platform for smart EV industry through empowering automakers and suppliers to collaborate in industry standard formulation, product and technology co-development, and industry-academia resource integration. These efforts will enhance industrial cluster development and help break through key technical bottlenecks, eventually accelerating the formation of a "trillion-yuan intelligent connected new energy vehicle industry cluster" in Chongqing.

The municipal government can provide further policy support for the R&D of the automotive parts industry, with a focus on supporting innovations for smart cabin and autonomous driving. Targeted support for innovative products in these areas will help solidify the competitiveness of core segments.

4.2 Promote the Application of Smart Manufacturing and Innovative Products to Lead in Auto Industry Transformation

Select OEMs and suppliers with solid foundation and innovation capabilities to create smart manufacturing role-model projects, promote the application of advanced smart manufacturing management systems and automa-

tion equipment, and drive the upgrading of the entire automotive parts industry.

Provide policy support to companies with significant achievements to reduce their development and application costs. At the same time, establish an IIOT (Industrial Internet of Things Platform) that covers the automotive parts industry, fostering supply chain, production, and technology collaboration among players and improving overall operational efficiency at industry level.

4.3 Strengthen International Cooperation to Expand Global Impact

Actively invite MNCs to build footprints in Chongqing, attract internationally renowned automakers and suppliers to increase investments in Chongqing, and facilitate the integration of global technology and management experience with local industries to accelerate the globalization process of Chongqing's automotive parts industry.

At the same time, encourage automotive parts suppliers in Chongqing to "go global" by supporting them in overseas investments and acquisitions, technology exchanges and global program cooperation, and connect them with key overseas markets in smart technology and innovative parts products, enhancing the global influence and reach of Chongqing's automotive industry.

Deploying the right power system technologies to enable Chongqing to fully embrace the AI era

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Abstract

Artificial Intelligence (AI) is emerging as one of the most consequential technologies of the 21st century, presenting a generational opportunity to boost economic competitiveness, improve productivity, and deliver a new wave of technological and scientific breakthroughs. AI is central to the pursuit of digital sovereignty, enabling strategic autonomy by empowering governments to shape their own digital ecosystems in line with their strategic interests.

The AI race is now also an infrastructure arms race. China, and many other global markets, are pursuing distinct AI strategies, shaped by geopolitical factors, the scale of investment, and energy infrastructure considerations. It is becoming increasingly evident that whoever can efficiently build the most flexible and resilient AI-capable energy system will set the pace for global AI leadership.

This paper aims to discuss the shift towards AI from a global perspective and provide some key insights into the technologies that can enable Chongqing's energy system to successfully navigate a fast-changing AI landscape in the years ahead.

1.Global shift towards an AI-powered future

The AI revolution is unfolding at a rapid pace globally, with AI applications already impacting many sectors and permeating people's daily lives. Earlier in 2025, a McKinsey survey found that 78% of organizations now report using AI in at least one business function, up from 72% in early 2024 and 55% a year earlier and that percentage can only be expected to increase significantly in the years to come.[1]

Within the energy space, AI is rapidly becoming a catalyst for more flexible and resilient energy systems - optimizing grid operations, forecasting demand, and accelerating the transition to a low-carbon future.

However, AI is also energy hungry and the infrastructure supporting its growth has become a strategic prior-

[1] *The state of AI: How organizations are rewiring to capture value, McKinsey, March 2025*

ity for governments. Scaling AI will require vast amounts of electricity to support the power-hungry data centers that underpin the AI economy.

According to the International Energy Agency (IEA[2]), approximately 945 TWh of electricity demand will be driven by data centers globally by 2030, with AI the primary driver of this demand growth. In fact, AI related electricity demand will account for around 10 % of global electricity demand growth to 2030. Economies that have seen a few decades of stagnant demand, could potentially see more than 20 % growth.

Experts also predict that approximately 125 GW of AI-specific data center capacity will be developed globally between 2025 and 2030[3], comparable to Spain's total installed generation capacity[4]. According to McKinsey[5], this projected growth will drive a transformative expansion of energy infrastructure. An estimated $5.2 trillion in capital will be invested into data centers globally by 2030, with around 25 % allocated to power generation, power grid development and modernization, cooling and electrical equipment.

As AI data centers proliferate, power grids must develop and adapt fast, to handle the evolving supply and demand dynamics. Urgent grid development, refurbishment and modernization of aging and underinvested grids will be required around the world.

Grids are already coping with increased complexities on the supply side with significantly more variable renewables and distributed power sources. This complexity will further increase as systems try to integrate new, and often fluctuating loads, from applications such as data centers, electric mobility, industrial electrification and cooling/heating. Digital technologies and power electronics will play a key role in addressing the challenge from a technology perspective.

Additionally, demand for critical grid equipment such as transformers is expected to increase significantly out to 2030 due to AI data centers, potentially leading to supply chain bottlenecks.

China's rapid emergence as a global AI leader

Pouring billions into AI infrastructure, China is rapidly emerging as a global AI leader due to its dynamic tech sector and strong government support.

AI adoption is accelerating across the country. At the beginning of 2025, the launch of Chinese startup DeepSeek's new AI model R1 was a major milestone that showcased China's advanced technical capabilities. Following DeepSeek's huge success, Chinese tech giants and AI startups have since been rolling out rivals, such as the

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[2] *Energy and AI, IEA, 2025*

[3] *The cost of compute power: A $7 trillion race | McKinsey, 2025*

[4] *Installed capacity | System reports*

[5] *The cost of compute power: A $7 trillion race | McKinsey*

release of Tencent's Hunyuan World-1 and Moonshot AI's open model Kimi K2.[6] At a recent expo in Beijing, Nvidia CEO Jensen Huang said, "Models like DeepSeek, Alibaba, Tencent, Minimax and Baidu Ernie bot are world-class, developed here and shared openly [and] have spurred AI developments worldwide.[7] To date, China has now launched 1,509 models out of the 3,755 models released worldwide – more than any other country.[8]

To drive this unprecedented AI development, multiple factors must be considered. The location of data centers is a strategic issue with wide-reaching implications. Where data centers are built determines who controls digital infrastructure, how fast services can respond, and who gets access to cutting-edge technologies like AI. These centers require significant investment to incorporate specialized hardware, massive energy and cooling capacity, and proximity to AI talent and research hubs. Such requirements make AI data centers less accessible to emerging markets which have limited access to AI infrastructure, thus contributing to creating a global AI tech divide. With the aim of ensuring that AI technology does not become exclusive to a few countries and companies, China recently proposed the creation of an organization to foster global cooperation on artificial intelligence. Such an organization would focus on the open sharing of AI, enabling all countries and companies to have equal rights to use it.

With the AI revolution being driven by compute power, China has been accelerating investments in digital infrastructure, including a significant buildout of domestic data centers to support its AI ambitions. By 2024, there were around 450 data centers in China, the highest in the Asia-Pacific region and the fourth highest number in the world.[9] In 2025 also, a significant portion of China's AI investment is expected to flow into building data centers and the energy infrastructure needed to support them; a Bank of America report projected that capital expenditure on AI will reach 600 - 700 billion yuan (US$84 -US$98 billion) in 2025, representing as much as 48% overall growth this year for China's AI capex from 2024.[10] Looking further ahead, China's power consumption by data centers is expected to increase by 170%, (to 277 TWh), between 2024 and 2030, according to the IEA.[11]

China's data centers are currently located mostly in the east of the country, but a shift of computing and data processing infrastructure to the country's renewables-rich western regions has been taking place. This shift is driven by the 'East Data, West Computing' (EDWC) government initiative launched in 2022.[12] The EDWC aims to shift data center infrastructure from energy-constrained eastern cities to resource-rich western provinces, leveraging renewable energy and lower land costs to power large-scale AI workloads. It aims to build a nationwide information technology network, with eight national computing hubs – one of which will be in the Chengdu-Chongq-

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6 *China's AI firms roll out DeepSeek rivals in open-source drive, China Daily, July 2025*

7 *Ibid.*

8 *Ibid.*

9 *Leading countries by number of data centers as of March 2025, Statista, March 2025*

10 *China to spend up to $98 billion on AI in 2025: report, Tech in Asia, June 2025*

11 *Energy and AI, International Energy Agency (IEA), April 2025*

12 *Launch of the "East Data, West Computing" initiative and its core focus areas, Tsinghua University's Institute for Internet Industry, February 2022*

ing region. Ten national data center clusters are also part of the plan.

In line with this, more recently, the National Energy Administration (NEA) issued a new action plan to coordinate planning for data centers and energy infrastructure in regions with abundant new energy resources. The aim is to help meet surging electricity demand from high-performance computing facilities.[13] The government has also issued policies supporting direct transmission of renewable electricity to data centers which will support the adoption of green power by data centers.

China's ability to rapidly supply green energy has been a significant advantage for the country in advancing its AI infrastructure. In 2024, China added a record 373 GW of renewable energy capacity, according to the NEA.[14] The country's renewables capacity nearly doubled year-on-year in the first half of 2025, according to the China Electricity Council, and is expected to continue growing rapidly in the years ahead.[15] A report by the State Grid Energy Research Institute forecasted a doubling of the country's renewables capacity to over 3,000 GW between 2024 and 2030.[16]

Enabling a robust energy system to power the future of AI

The expected increase in data center power demand will require grid infrastructure and in turn increase demand for critical grid equipment, such as transformers, switchgear, and power quality solutions.

In an AI data center, a rack is used to house specialized AI hardware such as GPUs (Graphics Processing Units). These specialized units require higher power density and advanced cooling systems due to the intense heat generated by AI model training and inference. According to the Ministry of Industry and Information Technology, China already operates more than 8.3 million standard racks in data centers. Planned AI compute clusters could add millions of AI-class racks over the next five years, resulting in significant demand growth for large power transformers plus multiple new 220–500 kV substations. China is also building ultra-high-voltage (UHV) transmission corridors to connect inland renewable generation to coastal AI and industrial hubs, ensuring that power availability does not become a constraint on AI competitiveness.

As the world's largest maker of transformers and high-voltage switchgear, Hitachi Energy's manufacturing capabilities are at the heart of building the robust grid infrastructure needed to power the future of AI. Driven by the increasing global demand for electrification infrastructure and supporting technologies, Hitachi Energy invested over US$3 billion in the three-year period up to 2024 in manufacturing, engineering, digital, R&D, partnerships and talent scale up. The company has announced a further investment of more than US$6 billion up to

[13] *China hopes to power AI boom with green energy in new data center strategy, South China Morning Post, June 2025*

[14] *Renewable energy accounts for 56 pct of China's total installed capacity, NEA, 2025*

[15] *Renewables capacity doubles in first half, China Daily, July 2025*

[16] *China speeding up green shift to clean energy future, China Daily, July 2025*

2027. US$1.5 billion of this investment will be focused on expanding global transformer[17] manufacturing capacity, addressing the growing need for transformers driven by increasing electrification and new demand loads from applications such as AI data centers.

In Chongqing, Hitachi Energy's state-of-the-art transformer factory is playing a critical role in addressing fast-growing demand in the region and enabling the supply of sustainable energy globally. Earlier this year, for instance, the factory supported State Grid Corporation of China (SGCC) to position Chongqing's first converter station for a UHV link bringing in clean power supplies from renewables-rich Xinjiang to the city. This project has now expanded Chongqing's electricity supply by 20%, with renewables accounting for 70%, contributing to mitigating power shortages and meeting the city's growing energy needs. Hitachi Energy's factory in Chongqing also supplies transformers to other countries including Saudi Arabia, Australia, Japan, and Thailand, supporting their energy transition efforts. Following its relocation to Liangjiang New Area in 2023, the factory has already expanded capacity by 30% with a second phase kicked off in 2025 and further potential under review.

While transformers will be essential to ensure speedy deployment of AI data centers globally, the story does not end there. There are many other technologies, solutions and services needed across the plan, build, and operate phases of the data center value chain. AI data centers will drive demand for different types of switchgear, particularly high voltage Gas-Insulated Switchgear (GIS), Air-Insulated Switchgear (AIS) and Hybrid Switchgear, as well as electrical disconnectors and Generator Circuit-breakers (GCBs). Supporting China's growth while also ensuring a sustainable approach, Hitachi Energy will deliver the world's first SF6-free 550 kV GIS switchgear to the Central China Branch of SGCC.

Battery Energy Storage Systems (BESS) will be required for data centers co-located with generation, particularly renewables, to provide back-up power and resilience, as well as for smoothing some of the fluctuations in AI workloads. As another example, both grid operators and AI data centers will require power quality solutions such as E-STATCOMS, voltage regulators and active harmonic filters providing both grid stability services as well as protecting sensitive equipment and supporting high-performance workloads like AI training.

2.AI technologies transforming China's industrial landscape

AI has tremendous potential to support and accelerate a secure, sustainable and affordable energy transition. Benefits of AI technologies and solutions range from the optimization and efficient grid integration of variable renewable energy resources to the unlocking of new revenue streams enhancing demand-side flexibility. AI will also accelerate the exploration of performance materials that support the next generation of clean energy and storage technologies. China is already leveraging AI applications.

[17] *Hitachi Energy invests US$250 million to boost production of critical transformer components, Industry Insider, March 2025*

Across China's diverse industrial landscape, AI applications are driving a transformation of traditional manufacturing processes by enabling real-time data collection, advanced analytics and automated decision-making.[18] With AI's industrial footprint growing rapidly, there are now over 30,000 basic-level smart factories, 1,200 advanced facilities and 230 "exemplary" intelligent factories operating in China, covering 80% of the country's manufacturing sectors, according to the Ministry of Industry and Information Technology.[19]

As a leading industrial hub, Chongqing has a promising potential for AI development and is actively driving the expansion of AI infrastructure, with efforts focused on areas such as smart manufacturing, new energy vehicles, and integrating AI into urban planning and governance, among others. Moving forward, Chongqing is set to continue benefitting from the "East Data, West Computing" (EDWC) initiative, as one of the eight national computing hubs.

Two data clusters are already emerging in the region and have received significant investment across districts in the Chongqing and Chengdu Tianfu New Area. Reflecting the current concentration of data centers in the east, Chongqing currently hosts 16 large and ultra-large data centers, compared to over 90 internet data centers in Beijing, 70 in Guangdong, and around 40 in Shandong.[20] This creates a significant opportunity for Chongqing to set up more data centers closer to its users and strengthen its position as a growing hub for AI.

Focusing on the energy sector, AI applications to accelerate energy transition can be differentiated across four areas: renewable power generation and demand forecasting; grid operation and optimization; energy demand management; and materials discovery and innovation[21].

Hitachi Energy is not only enabling the deployment of AI by providing key technologies like HVDC systems, Transformers and Switchgear but is also leveraging digital technologies, power electronics and the benefits of AI to create innovative solutions. Some key examples include:

- **Nostradamus AI** is forecasting software that enables users to improve the accuracy, speed and efficiency of forecasting wholesale energy prices. This, in turn, enables more efficient investments and operations thereby speeding up energy transition.[22]

- **Lumada Asset Performance Management (APM)** is a software solution designed to help asset-intensive industries optimize the performance, reliability, and lifecycle of their critical infrastructure assets. Reported benefits include up to 15% improvement in asset availability and 20% increase in labor produc-

[18] *Blueprint to action: China's path to AI-powered industry transformation, World Economic Forum (WEF), January 2025*

[19] *Computing power drives AI revolution, China Daily, May 2025*

[20] *Letter from the Chongqing Municipal Big Data Application Development Administration Regarding Proposal No. 1150 of the Third Session of the Sixth CPPCC National Committee, Chongqing Municipal Big Data Development Bureau, May 2025; Forecast 2022: China IDC industry overview, Infoobs.com, September 2022*

[21] *WEF_Harnessing_AI_to_accelerate_the_Energy_Transition_2021.pdf, World Economic Forum (WEF), September 2021*

[22] *Energy price forecasting with AI tools, Hitachi Energy, June 2025*

tivity[23]. This advanced APM solution was recently deployed to help Inner Mongolia Power in an ambitious grid modernization project.[24]

- **Virtual Power Plants (VPPs)** are networks of decentralized energy resources - such as rooftop solar panels, electric vehicles —that are digitally connected and coordinated to function as a single power plant. As China accelerates its energy transition, VPPs are becoming a strategic enabler of grid flexibility and renewable integration. Recently, Hitachi Energy teamed up with China Southern Power Grid to launch the first VPP in China, a digital solution which is supporting a more flexible and efficient power grid in Shenzhen.[25] To address evolving market demands, Hitachi Energy later developed 'VirtuPlan', an initiative providing virtual planning capabilities and services. VirtuPlan has been successfully deployed in landmark projects including Zhejiang Energy Group's first VPP and Huaneng Zhejiang's pilot VPP.

3. Conclusion and recommendations to CMIA

By leveraging the benefits of advanced AI applications and technologies, Chongqing has a generational opportunity to become an essential data hub contributing to China's broader AI goals. We offer the following recommendations for Chongqing to enable this vision:

- **Chongqing can play a pivotal role in advancing China's AI ambitions by serving as a regional innovation hub for pioneering and deploying scalable, AI-driven solutions across power sector operations.** As a major industrial and smart city hub in western China, Chongqing is well-positioned to deploy AI in managing complex power systems including integration of renewables, managing fluctuating loads and improving grid flexibility and resilience. Chongqing's investments in digital infrastructure and sustainable development, including smart substations and near-zero carbon industrial parks, align with national goals to decarbonize the energy system while enhancing efficiency through AI. By piloting scalable AI applications and solutions, Chongqing can help bridge regional innovation gaps and support China's transition to a more secure and sustainable energy future.

- **Build the grid infrastructure needed to power Chongqing's AI economy:** To address AI's infrastructure challenges, it is important that Chongqing continues to invest in grid infrastructure that can support datacenters and AI deployment across its industrial sectors. This should include the expansion of existing grids, as well as refurbishment and modernization of power grids where needed, ensuring that grid infrastructure does not become a bottleneck to AI deployment. Continued build-out of low carbon power to

[23] *Lumada APM, Hitachi, 2023*

[24] *Hitachi Energy's advanced APM solution helps Inner Mongolia Power in ambitious grid modernization project, Hitachi Energy, July 2025*

[25] *Hitachi Energy's innovative digital power plant solution gives secure power supply for China's megacity, Hitachi Energy, December 2021*

feed AI's massive energy needs, and supporting the accelerated build-out of additional manufacturing capacity for critical grid technologies will also be important.

- **Close alignment of energy policy and AI vision:** Taking a strategic approach to an AI-powered industrial transformation in Chongqing will be essential. Chongqing should continue to adopt forward looking strategies that reflect the rising AI economy, while ensuring the integration of energy policy and AI policy given their inter-connectedness. This will be critical to leading and guiding the development of energy-efficient AI infrastructure in Chongqing.

- **Expand domestic and international collaborations on AI:** Chongqing should consider fostering cross-stakeholder partnerships to enable widespread AI adoption. Locally, this would require closer collaboration across government, industry, and communities to add greater momentum. Internationally, Chongqing should also leverage opportunities created by existing platforms, such as the IEA's Energy for AI - AI for Energy initiative and the World Economic Forum's (WEF's) AI Governance Alliance, as well as emerging ones like China's proposed global AI cooperation, to develop new, impact-driven collaborations.

- **Cultivate a strong AI talent pool:** Chongqing's education and research institutions should continue to scale up AI-related training programs to develop a highly skilled local workforce. This will help avoid potential talent shortages that could hinder AI ambitions. Such a workforce would drive local AI innovation and boost Chongqing's competitiveness in the field. These institutions could also build and expand partnerships with energy companies to develop specialized programs in energy-focused AI applications. Chongqing could establish dedicated AI innovation zones and incubators, offering incentives for AI professionals to work on real-world energy challenges - such as grid flexibility and resilience, renewables integration and carbon reduction.

Hitachi Energy hopes that the above examples and suggestions can provide inspiration to Chongqing on its journey towards becoming an AI-powered industrial leader as China prepares to embark on the next stage of its economic development based on its15th Five-Year Plan (2026-2030).

Artificial Intelligence Empowers Advanced Manufacturing

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Introduction

Currently, the global economy is undergoing profound changes, with new-generation information technologies, represented by artificial intelligence, reshaping the landscape and appearance of traditional industries with unprecedented speed and breadth. General Secretary Xi Jinping emphasized the need to comprehensively advance AI technological innovation, industrial development, and empowerment applications, pointing out the strategic direction for AI development. For two consecutive years, the "AI+" initiative has been written into the government work report, fully demonstrating the high importance and earnest expectations placed on the deep integration and application of AI in various economic and social fields. The Chinese economy is at a critical juncture of transforming towards a stage of high-quality development, urgently needing to achieve transformation and upgrading through technological innovation to enhance the resilience and vitality of economic development.

As a crucial manufacturing base in China, Chongqing is vigorously promoting "AI+Industry," committing to the deep integration of digital technology with the real economy. To thoroughly implement the national strategic deployment regarding AI development and industrial upgrading, and to fully draw upon international advanced experience, combined with the actual needs of Chongqing's industrial development, this report will deeply explore the application potential and practical paths of artificial intelligence in the advanced manufacturing sector, centered on the theme of "Building an AI Application Highland, Empowering High-Quality Industrial Development.

As a leading global automaker with over a century of profound accumulation, Ford Motor Company has consistently been at the forefront of technological innovation and industrial transformation. In recent years, Ford Motor Company has invested significantly in AI technology research and development and application, accumulating rich practical experience, particularly in smart manufacturing, intelligent products, and supply chain optimization. This report will draw upon Ford Motor Company's advanced global experience and insights, focusing on AI empowering advanced manufacturing, to deeply analyze its critical role in enhancing production efficiency, optimizing operational management, and promoting intelligent product upgrades, and to provide specific ideas and measures for the high-quality development of Chongqing's advanced manufacturing industry. We hope that through Ford's experience sharing, we can contribute to Chongqing's efforts in building an AI application highland and accelerating industrial transformation and upgrading.

Chapter 1: The Era Opportunities of AI Empowering Advanced Manufacturing

Advanced manufacturing is the lifeblood of a nation's economy and key to achieving industrial modernization and enhancing national competitiveness. Currently, global manufacturing is undergoing a profound transformation driven by new-generation information technologies such as artificial intelligence, big data, and cloud computing, with intelligent manufacturing becoming a significant trend in global manufacturing development. The deep integration of AI can not only significantly improve the production efficiency and product quality of traditional manufacturing but also foster new models and formats, opening up new strategic emerging industries and future development tracks.

As an important manufacturing base in China, Chongqing boasts a strong industrial foundation and a complete industrial chain. To promote the high-quality development of manufacturing, Chongqing has formulated and implemented the "Action Plan for Deeply Promoting High-Quality Development of Manufacturing in the New Era and New Journey in New Chongqing (2023-2027)" and deployed the "33618" modern manufacturing cluster system. Simultaneously, it launched the "Tian Gong Huan Xin" action for manufacturing digital transformation, aiming to upgrade the "Industrial Brain + Future Factory" new model and promote the "intelligent, digital, and green transformation" of traditional industries. In this context, fully integrating AI technology into advanced manufacturing is of great strategic significance for Chongqing to achieve industrial transformation and upgrading and enhance regional competitiveness.

AI empowering advanced manufacturing is primarily reflected in the following aspects: First, enhancing production efficiency and automation levels. Through introducing AI-driven robots and automation systems, highly automated production processes can be achieved, reducing manual intervention, thereby significantly improving production efficiency and shortening production cycles. The application of AI on production lines ensures precision and consistency in the production process, minimizes human errors, reduces scrap rates, and thus enhances overall production benefits.

Second, optimizing operational management and decision-making. AI can perform deep analysis on vast amounts of production data, equipment operation data, and supply chain data to discover patterns and predict trends. For example, through predictive maintenance, interventions can be made before equipment failures occur, avoiding unplanned downtime; by optimizing the supply chain, more accurate demand forecasting, more efficient inventory management, and optimized logistics and distribution can be achieved, thereby reducing operating costs and improving management efficiency.

Third, promoting product intelligence and innovation. AI is the core driving force for intelligent products, especially in fields like intelligent networked new energy vehicles and intelligent equipment. AI applications enable products to perceive, learn, decide, and execute, providing safer, more convenient, and more personalized user experiences. At the same time, AI can accelerate the new product development cycle, enhancing product innovation capabilities through simulation and rapid prototype verification.

Fourth, facilitating industrial structure optimization and upgrading. The application of AI will drive manufacturing to ascend the value chain, extending from traditional production and manufacturing links to high-value-added links such as design and development, brand marketing, and service extension. Simultaneously, AI will foster new industrial forms, such as intelligent services and platform economy, injecting new vitality into economic development.

Fifth, strengthening industrial resilience and sustainable development. In a complex global economic environment, AI can help enterprises better cope with market fluctuations and supply chain disruption risks. Through intelligent resource allocation and production scheduling, the flexibility and adaptability of production systems can be improved. Furthermore, AI applications in green manufacturing and energy management will also assist manufacturing in achieving sustainable development goals. Therefore, integrating AI as a core driving force into Chongqing's advanced manufacturing system is not only an inevitable choice to align with global technological development trends but also a necessary path for Chongqing to achieve high-quality development and build modern industrial clusters.

Chapter 2: Ford Motor Company's Practice and Experience in AI-enabled Manufacturing

As a global leader in the automotive industry, Ford Motor Company deeply understands the immense potential of artificial intelligence in enhancing manufacturing efficiency, optimizing operations, and driving product innovation. Ford is actively deploying AI technologies globally, deeply integrating them into its manufacturing system and product development, accumulating valuable practical experience. "The integration of Artificial Intelligence (AI) is transforming the automotive sector, ushering in an era dominated by autonomous vehicles and altering conventional driving paradigms. Ford Motor Company stands at the forefront of this revolution, steering the future of transportation with its advanced AI-driven technologies."

2.1 Smart Manufacturing and Automation

Ford's integration of AI into its manufacturing processes particularly through automation, is a strategic move to enhance efficiency and precision on the assembly line. This has not only addressed challenges such as human error, inefficiency, scalability issues, and worker safety risks present in traditional manufacturing but also brought significant benefits.

In August 2025, Ford announced the release of the all-new Ford Universal EV production system and the Ford Universal EV platform, and the restructuring of the vehicle production process – aiming to completely reshape the traditional assembly line production model and develop an exceptionally advantageous new production system.

Ford continues to deepen its strategic layout in vehicle assembly in the United States, investing approximate-

ly 2 billion in the Louisville Assembly Plant to assemble Ford's new mid-size electric truck, which is expected to create 2,200 production jobs. The Louisville Assembly Plant will expand by 52,000 square feet to optimize material flow lines and will also undergo a comprehensive upgrade of its digital infrastructure. By then, the plant will become the fastest in network speed and have the most access points among all Ford plants globally, providing technical support for more intensive quality inspections.

In terms of production efficiency, Ford's team innovatively adopted a "tree-like workflow" to replace the traditional linear assembly line. This system achieves a leap in efficiency by coordinating three parallel assembly lines to complete the final vehicle assembly. For the front and rear body modules of the vehicle, large single-piece aluminum die-cast body structures are used, replacing traditional multi-part structures, which improves assembly convenience and efficiency. Besides the front and rear body, the battery pack also becomes a structural component, and along with the interior system (including seats, center console, and carpets), it is pre-assembled into another subsystem. These three major modules will then be assembled at the final assembly node. Parts are pre-packaged into kits according to process requirements and delivered along the tree-like flow to operators. The kits include all fasteners, scanning equipment, and specialized power tools required for assembly, and the tool layout fully considers optimal ergonomic postures for workers, reducing worker fatigue.

The Ford Universal EV production system reduces non-conventional working postures such as twisting, stretching, and bending, significantly improving concentration from a human ergonomics perspective, thereby enhancing work efficiency. Through the deep integration of the Ford Universal EV production system and the Universal EV platform, the assembly time for the new mid-size electric pickup truck is reduced by 40% compared to the current model assembled at the Louisville Assembly Plant. The saved working hours will be used to optimize internal production and automation processes to strengthen quality and cost control, ultimately achieving a net assembly speed increase of 15%.

The Ford Universal EV electric vehicle platform significantly reduces product complexity and substantially improves production efficiency: the number of parts is reduced by 20%, fasteners are reduced by 25%, factory assembly stations are streamlined by 40%, and overall assembly time is shortened by 15%.

2.2 Predictive Maintenance and Operations Optimization

Ford's application of AI for predictive maintenance is transforming how the company manages and maintains its equipment in manufacturing facilities. This proactive approach addresses several persistent issues associated with traditional maintenance strategies. Ford's implementation of AI in optimizing its supply chain operations represents a strategic move to address the complexities and demands of modern automotive production.

- AI-driven Predictive Maintenance: Ford installs sensors on critical equipment throughout its manufacturing plants. These sensors collect data on various operational parameters such as temperature, vibration, pressure, and more. The data collected from these sensors are integrated into a centralized system where

it's continuously monitored. This integration allows for comprehensive visibility across all equipment. AI algorithms, particularly machine learning models, are used to analyze the sensor data. These models learn from historical data to recognize patterns and predict potential failures. Over time, as the models receive more data, their accuracy and predictive capabilities improve. When the AI system predicts a potential issue, it sends alerts to the maintenance team. These alerts provide details about the specific equipment, the nature of the potential failure, and the suggested timing for maintenance. This proactive approach significantly reduces unplanned downtime, extends equipment lifespan, lowers the costs associated with emergency repairs and unnecessary replacements, and improves workplace safety.

- Supply Chain Optimization: Ford has introduced AI technology into supply chain management to address the challenges of numerous components, dispersed suppliers, and complex logistics demands in automotive production.

- AI models enhance the accuracy of market demand forecasts by analyzing extensive datasets, including historical sales, market trends, consumer behaviors, and economic indicators.

- AI algorithms help maintain optimal inventory levels by continuously analyzing production needs and supply conditions. These algorithms dynamically adjust orders and inventory levels, minimizing the likelihood of excess stock or shortages.

- AI optimizes logistical operations by calculating the most efficient transport routes and schedules based on traffic conditions, delivery windows, and transportation costs. This reduces transportation costs, shortens delivery times, and lowers carbon emissions.

- AI tools analyze supplier performance and risk factors, assisting Ford in making informed decisions about which suppliers to prioritize or develop further.

- Outcomes and Benefits: AI-driven predictive maintenance and supply chain optimization enable Ford to allocate resources more effectively, improve operational efficiency, reduce risks, and enhance the flexibility and scalability of its supply chain, thereby better adapting to market changes.

2.3 Smart Factory and Logistics

Automated driving tech and AI could enhance efficiency and safety at Ford plants. Ford is also actively exploring the application of AI and automated driving technology within its factories for logistics and production processes, further enhancing the intelligence level of its plants.

- **E-SELF Trial**: A trial is underway to enable electric vehicles produced at the Ford Cologne EV Center, in Germany, to drive off the assembly line with no one at the wheel. Vehicles in the E-SELF trial not only drive themselves off the assembly line, they also self drive to final testing stations and self-charge before

parking, ready for delivery to customers. The E-SELF project uses vehicle-to-infrastructure communication to control and monitor vehicles. Sensors located around the plant can identify hazards in the vehicle's path, such as a person or another car, and vehicles are slowed or brought to a halt as required. This technology significantly improves the efficiency of internal factory logistics, reduces manual intervention, and ensures the safe movement of vehicles within the plant.

- **Generative AI in Internal Operations**: Ford also plans to leverage generative AI across the company, though that initiative remains in its infancy. For example, in call centers, a generative AI pilot project enables agents to search faster through large amounts of documents and various data types to better classify identifying patterns in call center data segmentation, and sentiment analysis. In developer teams, Ford's Office 365 workforce and developers are also actively using Microsoft Copilot in production. Copilot tools help save you minutes in writing test-case boilerplate code with anywhere from 20% to 40% in assistance predicting what piece of code is necessary to write functions. Trust me, we've seen productivity improvements in development. These internal applications, while not directly product-facing, indirectly support the overall development of advanced manufacturing by enhancing internal enterprise operational efficiency.

Chapter 3: AI Empowering Intelligent Upgrade of Automotive Products

The integration of Artificial Intelligence (AI) is transforming the automotive sector, ushering in an era dominated by autonomous vehicles and altering conventional driving paradigms. Ford Motor Company stands at the forefront of this revolution, steering the future of transportation with its advanced AI-driven technologies. Ford Motor Company actively embraces this trend, not only enhancing the intelligence level of automotive manufacturing but also committing to promoting the intelligent upgrade of automotive products, bringing consumers a safer, more convenient, and more enjoyable driving experience.

3.1 Development and Application of Advanced Driver-Assistance Systems (ADAS)

Ford's integration of AI in enhancing vehicle safety features represents a strategic initiative to elevate the standards of road safety. This integration addresses critical challenges in automotive safety, offering more effective and adaptive solutions. Advanced Driver-Assistance Systems (ADAS) are a significant manifestation of automotive product intelligence, and Ford has made significant progress in this area, continuously investing in R&D to achieve higher levels of autonomous driving.

- **BlueCruise**: Ford launched BlueCruise, the world's first SAE Level 2 advanced driver-assistance system, in 2020. It effectively alleviates the stress and fatigue of long-distance driving while reducing potential risks caused by human driving errors. BlueCruise integrates ADAS map data, cameras, radar sensors, and GPS positioning systems. Once activated, the system automatically determines whether the vehicle can

enter Active Driving mode under current road conditions and alerts the driver with clear indicators on the dashboard. This feature integrates full-speed range adaptive cruise control and lane centering assist, capable of simultaneously controlling acceleration, deceleration, and steering, truly achieving active driving assistance. Customers using BlueCruise are already experiencing the benefits of hands-off driving.

BlueCruise has ranked first for two consecutive years in the evaluation of mainstream active driver-assistance systems in the North American market by *Consumer Reports*, an authoritative magazine under the Consumers Union. Globally, users have cumulatively driven over 200200 million kilometers using Ford BlueCruise. In the United States and Canada alone, users have accumulated over 3.13.1 million hours using BlueCruise, achieving over 340340 million kilometers of hands-free driving.

In the Chinese market, BlueCruise has been equipped on multiple locally produced Ford models, including Ford Mondeo, Ford Edge L, Ford Mustang Mach-E, Lincoln Corsair, Lincoln Nautilus, Lincoln Aviator, and Lincoln Z. It is applicable on over 400,000400,000 kilometers of highways and expressways nationwide. On specific road sections within the BlueCruise map coverage, vehicles equipped with BlueCruise can independently control acceleration and deceleration within a speed range of 0−1300−130 km/h and maintain the vehicle in the center of the current lane, without requiring the driver to control the accelerator or steering wheel, greatly reducing fatigue during long-distance highway driving and making travel safer and easier.

- **Latitude AI's Establishment and Level 3 Autonomous Driving**: Ford Motor Company has established Latitude AI, a wholly owned subsidiary focused on developing a hands-free, eyes-off-the-road automated driving system for millions of vehicles. Latitude AI will focus more narrowly on Level 3 tech—eyes-off, hands-off systems that are currently seeing their first commercial debuts. Latitude AI has a 550-person team, bringing expertise in machine learning, robotics, software, sensors, systems engineering and test operations. Ford hired about 550 employees formerly of Argo AI across machine learning and robotics, cloud platforms, mapping, sensors and compute systems, test operations, systems and safety engineering. The establishment of Latitude AI reflects Ford's strategic shift last year to focus on automated driving technologies for personally owned vehicles. We see automated driving technology as an opportunity to redefine the relationship between people and their vehicles. The deep experience and talent in our Latitude team will help us accelerate the development of all-new automated driving technology – with the goal of not only making travel safer, less stressful and more enjoyable, but ultimately over time giving our customers some of their day back.

3.2 Innovation and Breakthroughs in Autonomous Driving Technology

Ford's venture into autonomous vehicles is a significant part of its innovation strategy, using Artificial Intelligence (AI) to revolutionize how vehicles perceive, navigate, and respond to complex environments.

- **AI-driven Perception and Decision-Making**: Ford's autonomous vehicles are equipped with advanced

sensors and cameras that gather a wide range of data about the vehicle's environment. This includes radar, lidar (which uses laser light to map surroundings in detail), and cameras that provide a 360-degree view around the vehicle. The data collected from these instruments are processed in real-time by AI systems onboard the vehicle. These systems use sophisticated algorithms to interpret the data, recognize objects, understand traffic signals, and make navigational decisions.

- **Machine Learning and Continuous Learning**: The AI systems within Ford's autonomous vehicles enhance their decision-making abilities over time through machine learning. By analyzing data from countless hours of driving, the vehicles learn to handle a wide variety of traffic situations more effectively. This continuous learning capability ensures the system's adaptability and performance optimization.

- **Rigorous Testing and Simulation**: Before deployment, Ford's autonomous vehicles undergo rigorous testing in both real-world environments and simulated scenarios to ensure that the AI systems can handle unexpected situations safely.

- **Advantages of Autonomous Driving**: Autonomous vehicles, by removing human error—the principal factor in most traffic accidents—can markedly lower accident rates and bolster road safety. AI-enabled vehicles have the capability to communicate with one another and with traffic management systems, streamlining traffic flow, easing congestion, and shortening travel times. Autonomous vehicles provide mobility solutions for those who are unable to drive, offering greater independence and improving quality of life for many individuals.

3.3 Smart Product Feature Innovation

In addition to advanced driver-assistance and autonomous driving, Ford also applies AI to the innovation of specific product functions to enhance user experience and productivity.

- **Pro Trailer Hitch Assist**: The all-new Ford Pro Trailer Hitch Assist available exclusively for Ford F-Series uses sophisticated artificial intelligence, including computer vision and machine learning, to automatically back up and align a truck's hitch ball to a trailer coupler with a button push. Ford's in-house team secured 60 patents while developing this industry-first technology, which automatically controls the truck's speed, steering, and braking to make sure the trailer hitch ball is directly under a conventional trailer coupler. Pro Trailer Hitch Assist is the latest example of Ford applying advanced technology to deliver smart solutions that improve the productivity of customers.

Through continuous investment and innovation in advanced driver-assistance systems, autonomous driving technology, and intelligent product features, Ford Motor Company has not only enhanced the competitiveness of its own products but also set a benchmark for the intelligent development of the entire automotive industry. These experiences demonstrate that AI is a key driving force for automotive products to transform from "transportation tools" to "intelligent mobile terminals."

Chapter 4: Deepening AI Application to Boost High-Quality Development of Chongqing's Advanced Manufacturing

Drawing upon Ford Motor Company's rich experience in AI-enabled manufacturing and intelligent product upgrades, and combining it with Chongqing's strategic goal of "Building an AI Application Highland, Empowering High-Quality Industrial Development," this chapter will propose specific suggestions and measures for the high-quality development of Chongqing's advanced manufacturing industry.

4.1 Promoting Intelligent Manufacturing Transformation and Upgrade

Chongqing should fully leverage AI technology to accelerate the digital and intelligent transformation of traditional manufacturing, building an efficient, flexible, and green intelligent manufacturing system.

- **Encourage AI-driven Automation Applications:**

- Drawing on Ford's experience in widely applying AI-driven robots and collaborative robots in welding, painting, and assembly, encourage Chongqing manufacturing enterprises, especially automotive and parts companies, to introduce intelligent robots to enhance the automation level and precision of production lines. The government can establish special funds to provide subsidies or tax incentives for enterprises purchasing and applying intelligent manufacturing equipment.

- Support enterprises in building "Future Factories," utilizing AI technology for real-time collection, analysis, and visualization of production data, optimizing production processes, and improving production efficiency and resource utilization. For example, promote the application of vehicle-to-infrastructure communication technology, as seen in Ford's E-SELF trial, for internal factory logistics to achieve automated transportation of materials and semi-finished products within the plant.

- **Strengthen Predictive Maintenance and Operations Optimization:**

- Encourage manufacturing enterprises to install smart sensors and utilize AI algorithms for real-time analysis of equipment operation data, predicting equipment failures, and enabling on-demand maintenance. This will minimize unplanned downtime, extend equipment lifespan, and reduce maintenance costs.

- Guide enterprises to use AI for demand forecasting, inventory management, and logistics optimization, improving supply chain transparency, resilience, and efficiency. Support the construction of AI-based industrial internet platforms to promote data sharing and collaboration among upstream and downstream enterprises in the industrial chain.

- **Support Key Software and Industrial Intelligent Platform R&D:**

- Encourage and support local enterprises and research institutions in developing vertical domain industry

large models, intelligent agents, and key AI software products to provide customized intelligent manufacturing solutions for the manufacturing industry.

- Integrate AI as the core of the "Industrial Brain," enabling it with stronger data analysis, decision support, and resource allocation capabilities to empower the construction of more "Future Factories."

4.2 Accelerating Intelligent Product Innovation and Supply

Focus on Chongqing's "33618" modern manufacturing cluster system, especially advantageous industries like intelligent networked new energy vehicles, by empowering products with AI to enhance their intelligence level and market competitiveness.

- **Promote the Development of Intelligent Networked New Energy Vehicles:**

- Drawing on Ford's BlueCruise and Latitude AI experience, encourage local automotive enterprises to increase R&D investment in Level 2, Level 3, and higher-level autonomous driving technologies. The government can provide R&D subsidies, talent introduction policies, and promote the construction of intelligent networked vehicle test demonstration zones to facilitate technology verification and commercialization to support the research and development of Advanced Driver-Assistance Systems (ADAS) and autonomous driving technology.

- Support automotive enterprises in utilizing AI to develop more innovative in-car features, such as Ford's Pro Trailer Hitch Assist system, to enhance user experience and product added value.

- **Strengthen Innovation in Intelligent Equipment and Robotics:**

- In addition to industrial robots, support the research, development, and production of high-level embodied intelligent robots such as service robots and special robots, expanding the application of AI in different scenarios.

- Promote the industrialization of intelligent equipment: Focus on areas such as industrial mother machines and precision instruments, using AI to enhance the intelligence and flexibility of equipment to meet the needs of personalized, small-batch production.

- **Expand the Intelligent Hardware Product Matrix:**

- Encourage innovation in AI terminal products. While Ford primarily focuses on automobiles, Chongqing can draw on its ideas for product intelligence to encourage enterprises to develop and produce AI phones, AI computers, intelligent servers, smart wearables, smart home devices, AR/VR equipment, and other smart hardware products, building a diversified smart product ecosystem.

4.3 Building an AI Application Ecosystem

To ensure the deep integration and sustainable development of AI in the advanced manufacturing sector, Chongqing needs to build a comprehensive AI application ecosystem.

- **Strengthen Deep Integration of Industry, Academia, and Research:**

- Establish Joint Innovation Centers: Encourage leading international enterprises like Ford to co-establish AI and intelligent manufacturing joint innovation centers with local universities, research institutes, and key enterprises in Chongqing, jointly conducting forward-looking technology R&D, application demonstrations, and talent cultivation.

- Promote Technology Commercialization: Establish special funds to support the transformation of AI research achievements into manufacturing applications, bridging the gap from “laboratory” to “production line.”

- **Build a High-Caliber Talent Pool:**

- Increase AI Talent Cultivation and Attraction: Optimize relevant university programs to meet the demand for AI applications in advanced manufacturing, cultivating interdisciplinary talents. Introduce more attractive talent recruitment policies to attract top global AI scientists and engineers to Chongqing.

- Conduct Skills Training: Provide AI and digitalization skills training for manufacturing workers to enhance their ability to operate and manage intelligent equipment, adapting to the needs of industrial transformation and upgrading.

- **Improve Data Infrastructure and Sharing Mechanisms:**

- Build Industrial Big Data Platforms: Promote the construction of unified industrial big data platforms, breaking down data silos between enterprises, realizing interconnection of production, operation, and supply chain data, and providing high-quality data support for AI applications.

- Establish Data Security and Privacy Protection Mechanisms: While promoting data sharing, ensure data security and privacy protection to alleviate enterprises’ concerns about data sharing.

- **Optimize Policy Environment and Standard System:**

- Formulate Incentive Policies: Introduce more specific and operable incentive policies for AI applications in advanced manufacturing, including financial subsidies, tax reductions, project support, and demonstration application promotion, to reduce enterprise transformation costs.

- Improve Regulations and Standards: Gradually improve relevant regulations and standard systems for AI

applications in intelligent manufacturing and autonomous driving, providing a clear legal framework for technological development and commercialization.

- **Promote Generative AI Applications for Internal Enterprise Efficiency Improvement:**

- Encourage Enterprises to Adopt Generative AI Tools: Drawing on Ford's experience in applying generative AI in call centers and for developers, encourage Chongqing enterprises to explore applying generative AI in internal management, customer service, R&D design, and other areas to enhance overall enterprise operational efficiency and innovation capabilities.

Chapter 5: Conclusion

As the core driving force of the new round of technological revolution and industrial transformation, AI is profoundly changing the global economic landscape. As an important manufacturing base, Chongqing, at this critical stage of high-quality development, must seize the era opportunities brought by AI and deeply integrate it into advanced manufacturing to achieve industrial transformation, upgrading, and leapfrog development.

Ford Motor Company, through extensive global practices in smart manufacturing, product intelligence, and operational optimization, has fully demonstrated the immense potential of AI empowering advanced manufacturing. In smart manufacturing, Ford has significantly improved production efficiency, product quality, and production flexibility by introducing AI-driven robots, collaborative robots, and advanced manufacturing technologies. In operational management, the application of AI in predictive maintenance and supply chain optimization has effectively reduced costs, improved resource allocation efficiency, and supply chain resilience. In product intelligence, Ford's continuous investment and innovation in advanced driver-assistance systems (such as BlueCruise) and autonomous driving technology (such as Latitude AI), as well as breakthroughs in intelligent product features (such as Pro Trailer Hitch Assist), demonstrate how AI brings consumers a safer, more convenient, and more enjoyable driving experience. Furthermore, Ford's exploration in smart factory internal logistics (E-SELF trial) and the use of generative AI for internal enterprise efficiency improvement also provide diversified application examples for Chongqing.

In summary, Ford Motor Company's practical experience points the way for Chongqing to deepen AI application and boost the high-quality development of advanced manufacturing. Chongqing should fully draw upon these valuable experiences and continue to exert efforts in the following aspects: First, accelerate intelligent manufacturing transformation and upgrading. Comprehensively improve manufacturing efficiency and competitiveness by promoting AI-driven automation equipment, building smart factory solutions, popularizing predictive maintenance systems, and optimizing supply chain management. Second, promote intelligent product innovation and supply. Focus on key areas such as intelligent networked new energy vehicles, high-level embodied intelligent robots, and intelligent equipment, increasing R&D investment, innovating product functions, and meeting the growing mar-

ket demand for intelligent products. Third, build a comprehensive AI application ecosystem. Strengthen the deep integration of industry, academia, and research, build a high-caliber talent pool, improve data infrastructure and sharing mechanisms, and optimize the policy environment and standard system to provide a solid guarantee for the widespread application and sustainable development of AI.

Ford Motor Company has been deeply rooted in Chongqing for many years and has a profound understanding of the local industrial environment. We are willing to continue leveraging our international experience and technological advantages in AI and advanced manufacturing, working together with Chongqing City to explore new paths for AI to empower high-quality industrial development. We believe that through close cooperation and unremitting efforts from all parties, Chongqing will successfully build an AI application highland, contributing “Chongqing Wisdom” and “Chongqing Strength” to the development of advanced manufacturing in China and globally.

Develop an Ultra-Large-Scale Intelligent Urban Governance System Establish a Global Benchmark for "AI + City"

So Jinwoo
Vice Chairman of SK Group

As the largest municipality in China in terms of administrative area, permanent population, and complex urban topography, Chongqing faces unique governance challenges marked by its vast scale, dense population, mobility constraints, diverse settings, and significant environmental risks. Driven by global trends in urban digitalization and breakthroughs in AI, Chongqing is building an ultra-large-scale intelligent urban governance system under the concept of "AI + City". This initiative addresses Chongqing's governance challenges and improves public well-being, while offering a "Chinese approach" to intelligent urban governance that can serve as a model for other major cities in China and worldwide. This proposal systematically outlines how Chongqing can transform the complex challenges of megacity governance into opportunities for development, aiming to establish a global benchmark in intelligent urban governance. Rooted in national strategic priorities, it builds on Chongqing's unique characteristics and industrial base, while drawing on international case studies to offer strategic recommendations on key development priorities and collaborative approaches.

I. Smart Cities as the Strategic Convergence of China's New Urbanization and AI Empowerment Across Industries

1. Smart Cities as the Advanced Stage of Urban Digitalization

1）Stages of Urban Digitalization

In 2024, China's urbanization rate reached 67%, with 940 million permanent residents living in urban areas. The country is home to more than 700 cities, including nearly 30 megacities with populations over 5 million. China's urbanization has transitioned from incremental expansion to stock optimization and high-quality development. Urban digitalization is the cornerstone of high-quality urban development.

Urban digitalization is an ongoing process. China's urban digitalization has progressed through three stages: 1. Localized Exploration (2008-2014): Adoption of computer and information technologies to achieve refined urban management, shifting many services online. 2. Integrated Development (2015-2021): Expansion of digital applica-

tions through the ‘Internet Plus’ model, improving cross-departmental coordination and operational efficiency. 3. Transformation and Enhancement (2022-): Focus on AI-driven urban applications across multiple scenarios, greater openness and interconnection of data resources, and a transition from simple informatization to intelligent urban governance.

2 ）The Essence of a Smart City

A smart city represents the advanced stage of urban digital development, defined by AI-driven decision-making across all scenarios. Its hallmark is the creation of an urban intelligent entity that integrates multi-source data from governance, transportation, energy, ecology, and other sectors through AI algorithms. This enables an integrated system for urban governance and operations, characterized by real-time perception, intelligent analysis, precise decision-making, and dynamic optimization. This is not just a technological upgrade, but a fundamental transformation in urban governance, shifting from experience-driven to data-driven decision-making, from passive response to proactive early warning, and from fragmented management to systematic collaboration.

The Ministry of Housing and Urban-Rural Development has identified six key elements for building smart city infrastructure: a digital foundation, a city brain, a suite of application scenarios, a set of standards and specifications, a security system, and an operational mechanism.

2. Smart Cities as Abundant Scenarios for AI Empowerment Across Industries

China is prioritizing AI development. In 2024, AI was included for the first time in the *Government Work Report*. The 2025 Government Work Report called for the continuous advancement of the AI Plus initiative. In April 2025, the CPC Central Committee Political Bureau underscored the importance of strengthening AI development and regulation, emphasizing self-reliance and an application-oriented approach. On July 31, the State Council executive meeting reviewed and approved the *Guideline on Deepening the Implementation of the AI Plus Initiative*. This marked a concerted effort to advance China’s AI development toward a new stage of large-scale commercial application. This demonstrates China’s strategy of leveraging its advantages in supply chains, application scenarios, and market scale to accelerate AI application and popularization across various industries.

Ultimately, the value of AI technology must be realized through application in real-world scenarios, with smart cities serving as one of the most representative scenarios. In smart cities, AI can profoundly empower core domains such as government services, public services, urban management, transportation and logistics, emergency disaster prevention, and ecological protection. Due to the complexity of their economic and social activities, megacities have become the most promising yet challenging “super testbeds” for AI technology.

3. Differentiated Development of Smart Cities Across China

Currently, China's eastern regions lead in innovation, while the central and western regions achieve distinctive breakthroughs in smart city development. Beijing focuses on strengthening its role as the country's capital, looking to modernize the city's governance system and capabilities. Shanghai leads in pioneering trials for trusted urban data spaces and cross-border data flows. Shenzhen is leveraging its electronic information manufacturing strengths to build the "Pengcheng Cloud Brain", promoting AI-driven finance. In the meantime, China's regional hub cities within major urban clusters are developing smart industries through a scenario-driven approach that highlights local strengths. Chengdu is promoting the integration of "AI + Ecology"; Xi'an is developing smart culture and tourism through "Hardcore Technology"; Harbin is making advances in smart agriculture; and Wuhan is fostering smart healthcare and intelligent logistics.

Chongqing is the only city in China that combines the scale of a megacity, an extremely complex terrain, diverse risk scenarios, and its position as a national computing power hub. By establishing an AI-powered intelligent governance system for megacities, Chongqing is poised to become a benchmark for other major Chinese cities looking to integrate smart city models. Although advancing "AI + City" is highly challenging in terms of technology and operations, success in Chongqing would establish it as a benchmark and defining model for large cities to foster distinctive smart industries and build comprehensive intelligent governance systems.

II. Chongqing as a Benchmark for Building Intelligent Urban Governance Systems

1. Chongqing Serves as a Model City for Implementing National Strategies and Higher-Level Planning

The Chinese government places strong emphasis on accelerating urban digitalization and intelligent development. China's 14th Five-Year Plan explicitly incorporates AI-enabled urban governance as a key initiative. *The Implementation Plan for New Urbanization during the 14th Five-Year Plan Period* in 2022 specifically mandated "enhancing intelligent governance capabilities in megacities like Chongqing". Subsequent policy documents, including the *Five-Year Action Plan for New Urbanization Strategy* in 2024 and the *Guidelines on Establishing and Improving a Standard System for Intelligent Social Development and Governance* in 2025, further articulated directives to "actively advance green and smart city development" and "establish modern urban governance systems".

Chongqing has actively responded to these national strategies by proposing the "1361" Digital Chongqing framework. Additionally, in 2023, Chongqing was designated as a national pilot for both "Digital Twin City" and "City Brain" initiatives. In 2025, Chongqing published the *Three-Year Action Plan for AI-Enabled Modern Governance of Megacities*, aiming to develop 60 scenarios across nine key areas. By 2027, Chongqing aims to reduce

the response time for urban operation risk warnings to just five minutes, while ensuring that 98% of government services can be completed through seamless, one-stop online processing. These initiatives underscore Chongqing's proactive role in implementing national strategies, laying the policy foundations for the city to emerge as a benchmark in intelligent urban governance systems.

2. Chongqing's Megacity Scale and Complex Natural and Social Environment Demand Advanced Intelligent Governance

As the largest municipality in China by administrative area, population, and topographical complexity, Chongqing faces numerous challenges in urban governance. The city's total area is 82,400 km^2, five times the size of Beijing or thirteen times that of Shanghai. It manages 38 districts and counties, with significant urban-rural disparities. With a permanent population of 31.9 million, over 12 million of whom live in the main urban area, Chongqing faces extensive traffic challenges and a highly complex urban layout. Mountains cover 76% of the city's total area, with the Yangtze and Jialing Rivers traversing the urban landscape. This creates some of the nation's most complex challenges in managing three-dimensional transportation systems and underground space. With more than 12,000 sites exposed to geological hazards, the city also faces the possibility of multiple types of disasters occurring simultaneously. As the nexus between the Belt and Road Initiative and the Yangtze River Economic Belt, Chongqing accommodates a daily traffic volume exceeding 500,000 logistics vehicles.

This intricate urban fabric demands elevated governance standards across various domains, including infrastructure construction, transportation and logistics management, and disaster prevention. To meet these challenges, Chongqing must urgently harness AI technologies to enable precise perception, intelligent analysis, scientific decision-making, and collaborative execution citywide, thereby advancing intelligent governance.

3. Chongqing's High-Level Computing Infrastructure Provides Robust Support for Intelligent Governance

Strong local computing power, citywide information sensing and communication networks, and fully accessible data resources provide a solid foundation for Chongqing's intelligent governance system as a megacity. Chongqing is one of the 10 national big data center cluster cities under China's "East Data, West Computing" project. With one of the country's largest concentrations of large-scale data centers and abundant computing power reserves, including both general-purpose and intelligent computing, Chongqing ranks among the top-tier cities nationwide. This strong foundation in computing capacity, data transmission, and storage provides the essential infrastructure for building a intelligent governance system.

Chongqing is rapidly building a space-air-ground Integrated sensing network that combines satellite internet, drone-based inspections, and ground sensors to deliver comprehensive, multidimensional information perception. At the same time, the rapid rollout of 5G and the Internet of Things (IoT) provides a foundation for the efficient transmission and faster utilization of both administrative and industrial data.

Chongqing has established the Western Data Exchange Center, which promotes the release and sharing of public data in fields such as government services, transportation, and energy, laying the groundwork for diverse socialized data applications. In terms of industrial transformation and upgrading, the city is advancing intelligent manufacturing by developing smart factories and an "Industrial Brain". Together, these initiatives position Chongqing as both a digital hub of western China and a national leader in building intelligent governance systems.

III. Case Study and Lessons Learned from Smart City Development in South Korea

1. Overview of Smart City Development in South Korea

1）South Korea's "K-Smart City" Master Plan

To enhance the competitiveness of cities and the living standards of their citizens, the South Korean government has formulated a five-year national smart city master plan to promote smart city policies. The fourth phase of smart city master plan (2024-2028) envisions "an intelligent urban ecosystem where humanity and city achieve symbiotic integration and transcendent development". It outlines four strategic directions: 1. Promote sustainable urban intelligent spaces and operational models. 2. Build AI- and data-centric urban infrastructure. 3. Establish a business-friendly industrial ecosystem. 4. Foster internationalization.

This smart city master plan is not solely driven by cutting-edge technology; it aims to solve real-life problems by leveraging computing power and data infrastructure to enhance execution led by the private sector. This fosters an integrated smart city development model that combines government planning with private sector innovation.

2）South Korea's Digital Platform Government (DPG): Functions and Practices

The DPG is committed to building "a government where citizens, businesses, and the government collaboratively address social issues and create new value on a fully interconnected data platform". It is a governance model that leverages digital technologies to open service industry and administrative data, which is then used to customize administrative services and enhance policy efficiency. It follows key principles below.

① Citizen-centered services

The DPG adheres to a "citizen-centric" principle, delivering integrated, proactive, and tailored public services to ensure all citizens can conveniently access the services they need anytime, anywhere.

To achieve this, South Korea integrated the "Minwon 24" system in 2017 and subsequently launched "Government 24". Building on the previous system to further optimize services, "Government 24+" was launched on July 10, 2025. At the core of this upgrade is the introduction of Single Sign-On (SSO) functionality. Previously, citizens had to access services from multiple departments, such as welfare, employment, taxation, and healthcare,

through separate channels. With “Government 24+”, approximately 400 services are now available on a single interface, all accessible via SSO.

To make notifications more proactive and targeted, the DPG also introduced the “Benefit Reminder” feature. This service automatically pushes government benefit information to selected users by analyzing their circumstances and eligibility criteria. This means citizens receive support tailored to their life stage or situational changes, without needing to make active inquiries. The “Government 24+” initiative has been recognized as a representative case of enhancing citizen convenience while establishing a data-driven administrative infrastructure.

② Realizing the “One Government” through the “Public My Data Service”

The “Public My Data Service” is a system established under the *Electronic Government Act* and the *Civil Petitions Treatment Act*, designed to securely transmit and utilize cross-agency data resources. By replacing the previously required paper-based document submission with direct data transmission, it enables “zero-attachment” administration. Streamlining administrative procedures through this system is estimated to generate annual convenience benefits exceeding KRW 2 trillion. At the same time, cloud-based collaboration systems have significantly improved interdepartmental coordination and operational efficiency.

In essence, the “Public My Data Service” plays a pivotal role in realizing the “One Government” vision by streamlining administrative procedures, enhancing interdepartmental collaboration, and improving the precision of policy implementation. In addition, it is also expanding into the private sector, including finance and telecommunications, allowing administrative data to be directly used in processes such as loan applications, credit card issuance, and telecom service subscriptions. This not only enhances interdepartmental collaboration within the government but is also recognized as a key initiative for upgrading the public-private data utilization system.

The Smart City Policy is an integral part of the five-year national smart city master plan, which pursues sustainable urban operations by interconnecting multi-domain data across transportation, environment, security, and energy sectors. Meanwhile, the Digital Platform Government standardizes and consolidates such data at the national level to optimize policy-making and administrative services.

In practice, smart cities generate and utilize data locally, while the Digital Platform Government centrally manages this data to enhance service innovation and policy efficiency nationwide. Together, these two policies operate on a shared data foundation, complementing each other to enable comprehensive intelligent governance across national and municipal levels, producing substantial synergistic effects.

2. SK’s Practices in Smart City Development

1）SK’s Technological Advantages in AI Chips and AI Data Centers (AIDC)

SK Group is ramping up investments in AI chip R&D and AIDC construction, with plans to invest over 420

billion yuan by 2030. Its technology is at the heart of expansion and upgrades when it comes to future smart city ecosystems. It delivers the world's highest-performance storage and processing solutions for complex city-level data.

SK Hynix is a global leader in the High Bandwidth Memory (HBM) domain. HBM meets both performance and energy efficiency requirements, making it an indispensable technology for high-performance AI applications such as large-scale neural network operations, deep learning training, and image recognition. It is the leading memory solution for large-scale intelligent computing worldwide. SK Hynix continues to advance globally leading DRAM and NAND technologies and products, with the aim of addressing the latest data storage needs in AI servers and edge computing devices.

SK is collaborating with Amazon Web Services (AWS) and the Ulsan Metropolitan Government to operate South Korea's largest AIDC in Ulsan by 2027. This project is a collaborative effort among SK's member companies, including SK Hynix, SK Telecom, SK BROADBAND, and SK Gas. Together, these actors will cooperate across sectors such as semiconductors, telecommunications, power, and energy. Ulsan AIDC will evolve into a pivotal hub for industrial innovation, encompassing smart factories and digital twins.

SK is committed to building sustainable data and computing power infrastructure. Its member companies have strong technical expertise in energy efficiency enhancement and cooling optimization tailored for AI computing, enabling maximal reduction in AIDC energy consumption. SK's business portfolio is deeply intertwined with the environmental and energy sustainability considerations essential for smart city development, positioning the company as a pivotal player in global intelligent infrastructure construction.

In summary, SK Group's expertise in AI semiconductors and AIDC has moved beyond simply providing hardware. The group now provides foundational technologies that underpin the core infrastructure of smart city operations. These technologies are set to play a critical role in the expansion and upgrading of future smart city ecosystems.

2) SKT LITMUS' Application Practices in Smart Cities/Intelligent Transportation

SK Telecom's LITMUS (Location Intelligence Platform) is a service solution that supports the smart city development, serving as a core technology for enabling smart cities and intelligent transportation. LITMUS offers four major solutions: AI-enabled Population Mobility, Smart City, Ecological Monitoring, and Traffic Mobility. These solutions aim to enhance urban operational efficiency and policy-making precision.

① Population Mobility Solution: Using data from mobile devices, this solution provides real-time estimates of transient populations and enables detailed analysis by district, time, destination, and transportation mode. It supports urban planning, commercial and tourist flow management, commuter pattern studies, and other practical applications. This solution has been adopted by various cities and institutions, including Seongnam, Seoul Institute, and the Korea Tourism Organization.

② Smart City Solution: By analyzing urban infrastructure, environmental conditions, and population mobility data, the solution helps assess policy effectiveness and guide the design of new municipal services. In practice, this solution offers data-driven planning support for smart city construction projects in cities like Ulsan and Busan.

③ Ecological Monitoring Solution: This solution precisely calculates carbon emissions using travel destinations as parameters. For example, this solution has been used to promote green transportation and customize carbon reduction strategies to their regional needs in Sejong and Ulsan.

④ Traffic Mobility Solution: This solution uses real-time traffic flow data to optimize traffic signal control, reducing average intersection delays by about 14%, widely applied in Seoul and Incheon Digital Twin (ITS: Intelligent Transportation System) construction projects.

The LITMUS platform's core strength lies in real-time, precise, and scalable location data analytics, which significantly enhance urban monitoring, forecasting, and response capabilities. The LITMUS platform and its technical solutions received the award for "Best Mobile Innovation for Cities" at the 2023 GSMA GLOMO Awards, earning international recognition.

These case studies demonstrate that smart cities must move beyond purely technology-driven approaches and build comprehensive urban ecosystems based on data flows. The deep integration of AI semiconductors, AIDC infrastructure, and LITMUS solutions has notably enhanced the accuracy and efficiency of urban operational data. By combining technologies, infrastructure, and services, SK Group improves the effectiveness of smart city initiatives, providing a reference model for cities worldwide facing similar governance and operational challenges.

IV. Recommendations for Developing an Intelligent Governance System for Chongqing as a Megacity

Drawing on the smart city case studies in South Korea and considering the characteristics and challenges of Chongqing's smart city development, the following recommendations are proposed.

1. Advance the Upgrade of a People-centered Integrated Administrative Service Platform

1）Needs and Expected Outcomes

As a municipality directly under the central government, Chongqing must manage a population of over 30 million while addressing extensive administrative demands. This requires an integrated government service system that can enhance both administrative efficiency and service quality. Currently, Chongqing primarily relies on "Yu Kuai Ban" (Chongqing Fast Service) and "Yu Kuai Zheng" (Chongqing Fast Governance) to deliver integrated online and offline services. However, further upgrades are needed to transition toward a people-centric, integrated government service platform.

Once upgraded, the platform will not just streamline administrative procedures and improve service efficiency; it will also ensure stable government operations and enhance service quality through a data-driven administrative system. Ultimately, citizens' daily lives will become significantly more convenient, trust and satisfaction in government services will continue to rise, and the sustainability and competitiveness of the administrative system will be strengthened.

2）Recommendation

South Korea's "Government 24+" offers a highly valuable reference for Chongqing's government service upgrade. By effectively integrating these experiences, Chongqing is poised to achieve significant practical gains in key areas such as streamlining administrative procedures, enhancing user convenience, and strengthening data-driven administrative infrastructure construction.

Proactive Personalized Reminder Service: Automated Reminders Based on Life Cycle and Scenarios

South Korea's "Government 24+" platform features comprehensive maternity service packages such as "Safe Pregnancy & Childbirth Care". After registering a pregnancy, the system automatically pushes 14 related service notifications, covering key benefits such as iron supplement subsidies, medical treatment allowances, and maternity grants. Additionally, there is an "Exclusive Privileges" feature designed for citizens eligible for special benefits. Based on their personal qualifications, this service automatically matches and informs users of the benefits they are eligible for, along with the corresponding application procedures.

→ Chongqing could adopt this model by implementing a service notification mechanism based on a person's life cycle. Centered on key milestones in citizens' lives, from birth, education, employment to retirement, the system would automatically push tailored information on subsidy policies, allowances, and registration procedures, providing precise and convenient services that meet citizens' real needs.

Personalized Information Dashboard and Intelligent Search Function

South Korea's "Government 24+" platform consolidates and displays core user information through the "My Page" feature. The portal includes records of applied administrative services, progress on digital certificate processing, pending tasks with approaching deadlines, as well as daily life updates such as pension and passport statuses. This design allows users to conveniently manage multiple administrative processes, avoid missing critical tasks, and significantly improve document management and operational efficiency. Furthermore, the platform's intelligent search function goes beyond traditional keyword searches by recommending contextually relevant services based on user input. For example, when a user searches for "school enrollment", the system automatically suggests service portals for vaccination appointments and enrollment subsidy applications.

→ Chongqing could implement personalized information dashboards within the "Yu Kuai Ban" platform, enabling citizens to centrally manage key livelihood and government service data. This would include data like

housing rental information, social insurance status, vehicle registration details, and children's vaccination records, all through a single interface. At the same time, an optimized intelligent search function would allow citizens to input daily life-related queries and automatically receive linked government services along with step-by-step guidance. This approach would streamline search operations while delivering a more citizen-centric administrative experience tailored to everyday needs.

2. Strengthen the Public Data Governance System

1）Needs and Expected Outcomes

Chongqing should build on its accumulated experience in data applications, extending it across administrative management and the broader industrial landscape to strengthen the public data governance system. This is not only an initiative to enhance administrative efficiency but also depends largely on cross-departmental information connectivity and sharing to advance integrated public services under the "One Government" framework. At the same time, the city would need to treat data as a core production factor and strategic resource within the economic and industrial ecosystem. To achieve this, Chongqing must reinforce the institutional foundation for data applications and cultivate a trustworthy data environment across both public and private sectors.

With these upgrades, cross-agency data flows will achieve organic integration, significantly improving the precision and responsiveness of policy implementation. At the industrial level, data will emerge as a new factor of production, driving innovation, investment, and social participation.

Ultimately, Chongqing is poised to become a data hub that integrates administrative and industrial systems, becoming a strategic base for digital transformation in western China.

2）Recommendation

South Korea's "One Government" model based on the "Public My Data Service" is a representative case. South Korea has leveraged an institutionalized data transmission system and the right to request data, enhancing administrative efficiency, expanding its application to civil service domains, and increasing the credibility and economic value of data utilization. Chongqing can draw inspiration from the following approaches:

① Strengthen legal frameworks: South Korea has explicitly stipulated the "Right to Request Data Provision" in the *Electronic Government Act* and the *Civil Petitions Treatment Act*, requiring administrative agencies to provide secure transmission and utilization of data upon public request. Chongqing should similarly clarify data ownership and usage boundaries, strengthen personal information protection and security standards, and establish a robust legal and institutional framework to ensure the security and trustworthiness of data utilization across all systems.

② Facilitate public-private collaboration and digital economy development: By integrating public data with

private sectors such as finance, telecommunications, and healthcare, South Korea has been able to deliver tangible benefits for citizens' daily lives. At the same time, the country has advanced data transactions to foster a standardized and well-regulated data marketplace. This approach would allow public sector data to support industrial innovation and the development of new industries, further strengthening Chongqing's digital economy.

3. Establish a Comprehensive Smart Security Network

1）Needs and Expected Outcomes

As a megacity nestled between mountains and divided by rivers, Chongqing faces high risks from natural disasters such as earthquakes, floods, and landslides, as well as potential safety incidents stemming from outdated grassroots infrastructure. In this context, simply expanding disaster prevention facilities is no longer sufficient. It is imperative to establish a comprehensive safety infrastructure based on a citywide smart safety network capable of disaster and incident early warning and rapid response. This is a critical task for ensuring citizen safety and enhancing urban sustainability.

Building a smart security network would enable early risk detection and real-time response, which would, in turn, minimize disaster-related losses. It would also strengthen collaboration among government, industry, and civil society during emergencies, significantly improving the speed and precision of crisis response.

2）Recommendation

To establish a comprehensive intelligent security network across Chongqing, the following measures are recommended:

① Expand high-risk area sensing and integrate control: Deploy additional IoT sensors in high-risk zones, including underdeveloped regions, rural areas, underground infrastructure, rivers, and mountainous areas. Establish a centralized management system that integrates urban air mobility networks (UAM, drones) and smart terminals.

② Introduce intelligent location-based security solutions: With reference to SK Telecom's LITMUS case study, this solution has proven effective in real-time dynamic analysis, incident prevention, and route optimization in major cities like Seoul and Busan. When applied to disaster response in Chongqing, it would automatically generate safe routes for emergency vehicles and citizens during emergencies, analyze and manage mobility patterns in densely populated or infectious disease risk zones, and issue real-time alerts when individuals or vehicles enter hazardous areas. Together, these actions would lead to systematic optimization across the city.

Building the Hub for "AI + Intelligent Manufacturing" and Empowering Chongqing's Industrial Upgrading and Innovation Ecosystem

Dr. Xiao Song

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Abstract

Amidst rapid advancement of AI technology, a global systematic transformation is underway. AI is restructuring the industrial chains, shifting manufacturing sector from "cost competition" towards "intelligent competition". The competitive landscape is also being reshaped, facilitating structural adjustments in the talent pool. As a major manufacturing hub in the region and an important advanced manufacturing center in China, Chongqing is actively embracing the wave of AI. Leveraging its strengths in industries such as automotive, electronics, and equipment manufacturing, Chongqing offers a broad range of application scenarios and a solid foundation of practical experience in intelligent manufacturing. The city has introduced and implemented *the Action Plan for Advancing the "4+16" Framework Science, Technology, and Innovation Layout (2025–2027)*, which provides a strong basis for empowering industrial chain upgrades through AI. However, challenges remain in the development of Chongqing's AI industry, including insufficient accumulation of core algorithms and critical technologies, limited integration across the industrial chain, and a shortage of high-level AI talent. In response, Chongqing must build on its strengths while addressing its weak points, harnessing the advantages of its large-scale manufacturing base, comprehensive industrial chain, and strategic location as a regional hub. By fully tapping into the potential of "AI + Intelligent Manufacturing," the city can drive the deep integration of AI with traditional industries and achieve high-quality development.

Focusing on "AI + Intelligent Manufacturing", the technology and data-intensive nature of manufacturing industry provides vast application potential for AI technology. Across its three core value chains - product, production operations, and supply/delivery - numerous AI application scenarios have emerged, solidifying it as one of the most dynamic and promising fields in the current market. However, significant pain points persist on both supply and demand sides. On the R&D side, the manufacturing sector's stringent requirements for reliability and real-time performance result in considerable challenges for AI application and R&D progress, which includes higher complexity, protracted customization cycles, and high-quality data for model training. On the user side, traditional manufacturing enterprises are often with relatively weak data foundations. Their willingness to invest is significantly influenced by cost considerations and ROI expectations, which in turn fosters a cautious attitude towards AI

adoption and further impedes the effective deployment and scaling-up of AI applications.

This paper analyzes the current state of Chongqing's manufacturing industry and the challenges in the application of "AI + Intelligent Manufacturing." Drawing upon international AI development pathways and exemplary case studies, it summarizes cutting-edge application models and experiences in building innovation ecosystems and offers three key recommendations for Chongqing's industrial development.

- Promote Application: Centered on key industries such as automotive, electronic information, and advanced equipment, Chongqing should establish a smart development path for its manufacturing sector focused on "AI + Intelligent Manufacturing." Emphasis should be placed on promoting emerging technologies such as industrial foundation models, intelligent quality inspection, and digital twins.

- Build Ecosystem: Develop an innovative ecosystem that integrates government, industry, academy, research, and end-users. Leverage manufacturing resources and innovation capabilities from across Southwest China, optimize the collaborative layout of the industrial chain, accelerate the transformation of research outcomes into industrial applications, and provide targeted support for the digital upgrading of small- and medium-sized enterprises (SMEs) through specialized intelligent transformation initiatives.

- Cultivate Talent: For the need of the interdisciplinary technical demands of "AI + Intelligent Manufacturing," Chongqing should encourage collaboration between local universities, research institutions, and enterprises to jointly cultivate high-level talent. Efforts should also be made to establish professional training and certification systems, fostering an open, collaborative, and innovation-driven talent environment.

Finally, it is proposed that Chongqing position "AI + Intelligent Manufacturing" as a focal point for advancing its AI industry. The city should aim to build a comprehensive innovation ecosystem that links government, enterprises, universities, and industry associations. Siemens has recently established a new innovation and R&D center in Chongqing. Relying on its Xcelerator platform, this center can connect local manufacturers with innovation resources to promote collaborative innovation. Key areas include the research and deployment of AI application scenarios, empowerment of SMEs, and the cultivation of interdisciplinary talent. These collaborative efforts will support Chongqing in becoming a national leader and a western hub for the integrated development of "AI + Intelligent Manufacturing."

1.AI is ushering in systematic changes, driving industrial chain restructuring, competitive landscape reshaping, and talent structural realignment

Currently, AI is triggering a global systematic transformation, profoundly reshaping all aspects of socio-economic development. It will not only drive comprehensive restructuring of industrial chains – accelerating intelligent transformation across all sectors – but also reconfigure the global competitive landscape, elevating AI to a core determinant of national competitiveness. AI is also catalyzing workforce realignment: low-skilled positions

are being progressively replaced, while demand for high-skilled, compound talent surges dramatically. Confronted by this paradigm shift, we must implement proactive strategies to adapt to technological advancements, thereby capitalizing on AI-driven opportunities to propel high-quality global economic and social development.

1.1 Global Market

At present, the global economy is accelerating its transition into the industry 4.0 era, where cloud computing and big data constitute the foundational infrastructure, enabling AI advancement and formulating robust growth in AI technologies and industries. Since 2020, AI has consistently dominated Gartner's Top Strategic Technology Trends[1]. IDC projects the global AI market will surpass USD815.9 billion by 2028, demonstrating a formidable 32.9% CAGR[2]. Notably, generative AI's breakthroughs are triggering paradigmatic shifts in application scenarios, elevating AI from a specialized tool to systematic productivity infrastructure. Its strategic value has now escalated into a core determinant for reshaping national competitiveness

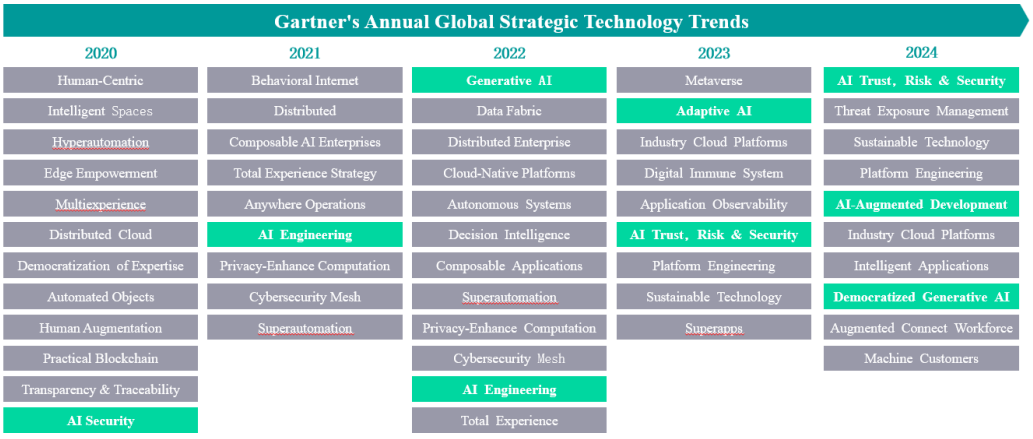

Figure 1 Top 10 Global Strategic Technology Trends

On one hand, AI is reshaping global manufacturing supply chains, shifting industrial competition from cost-based to intelligence-driven paradigms. First, AI disrupts traditional manufacturing models which are reliant on scale economies for unit cost reduction, instead achieving substantial cost reduction and operational efficiency through smart production systems. Furthermore, AI lowers labor cost advantages by automating repetitive tasks, reduces reliance on low-wage labor, and redirects investments toward intelligent systems. Ultimately, AI transforms competitive dynamics: in automotive sectors where mechanical performance historically dominated, competition now centers on AI capabilities. Enterprises like NIO and BYD position AI R&D as their "secondary growth engine", with smart cockpits and autonomous driving becoming core differentiators. In process industries, AI-driven real-time optimization supersedes human expertise in parameter adjustment, enhancing product quality, redefining competitiveness, and intensifying the competition in high-end markets.

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[1] *2020-2025 Gartner's Global Top 10 Strategic Technology Trends*

[2] *IDC "Worldwide Artificial Intelligence and Generative AI Expenditure Guide"*

On the other hand, AI accelerates restructuring of the international order through intensifying technological monopolies and standards competition. Technologically, China now holds 60% of global AI patents[3], while the U.S entrenches its dominance via export controls on AI chips. Regarding standards, the EU's *Digital Markets Act* (DMA) constrains data flows among tech giants, leveraging regulatory frameworks to impede open AI development. As a global technology leader, Siemens champions open ecosystem philosophy in international competition. It has jointly advocated with Deutsche Bank and Mercedes-Benz for regulatory streamlining in Germany, urging policymakers to foster conducive environments for technological advancement and industrial upgrading.

1.2 China Market

In recent years, China's AI industry has experienced rapid growth. According to CCID Consulting, the size of China's AI industry will reach RMB398.5 billion by 2025 and is expected to exceed RMB1 trillion by 2030.[4]

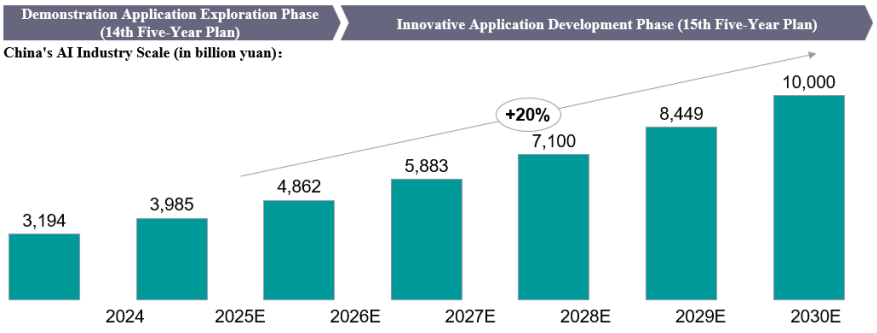

Figure 2 China's AI Industry (2024-2030)

The vigorous advancement of AI technology has emerged as a pivotal engine driving China's high-quality development, exerting profound impacts on fostering new quality productive forces and enabling industrial green transformation. In empowering new quality productive forces, AI accelerates intelligent upgrading of traditional industries: steel manufacturers e.g. Baowu Group leverages AI algorithms to optimize smelting process parameters, enhancing product compliance rates, while automakers such as Geely implement AI-driven intelligent production scheduling to boost manufacturing efficiency. Concurrently, AI propels rapid expansion of emerging industries – China's L2 ADAS penetration rate in new vehicles is projected to exceed 65% by 2025[5], and cities including Shenzhen and Shanghai pioneer AI-optimized drone deployment for emergency response operations. Furthermore, AI also catalyzes industrial green transformation through multiple pathways: energy utilization systems with intelligent distribution optimize efficiency, while process innovations enable low-carbon manufacturing. These advancements collectively steer China's industrial ecosystem toward climate-aligned development.

However, regarding workforce structural transformation, China's labor market has yet to demonstrate sig-

[3] *State Council Information Office of the People's Republic of China, 2025.4.24*

[4] *CCID Consulting, "2025 IT Trends" Release Conference*

[5] *Ministry of Industry and Information Technology (MIIT), 2024.10.19*

nificant realignment. AI is accelerating displacement of low-skilled, repetitive positions. Projections indicate generative AI tools could displace approximately 40% of entry-level accounting roles[6], while manufacturing employment may decrease by 8-12%[7] due to intelligent transformation. Comparing with the EU's *Horizon Europe* program facilitating traditional worker transitions, China's reskilling infrastructure for displaced labor remains underdeveloped. Conversely, demand for high-skilled roles surges dramatically. Recruitment for core AI positions—algorithm engineers, NLP specialists expands at over 40% annually[8]. "AI+X" multidisciplinary professionals with comprehensive competencies are dominant in the market. Yet supply-demand imbalances reveal a critical shortfall: China's AI talent gap currently reaches five million*9*. Enabling workforce transition from labor-intensive to technology- and knowledge-intensive models now constitutes the pivotal challenge for national education reform and employment restructuring.

1.3 Chongqing Market

Driven by the rising wave of AI, Chongqing is accelerating the deep integration of intelligent manufacturing with the digital economy, with the strategic aim of establishing itself as a leading hub for AI applications. As an important advanced manufacturing center in China, Chongqing boasts a comprehensive industrial chain that spans automotive, electronic information, equipment manufacturing, and materials. With leading enterprises such as CHANGAN Automobile, SERES, and Chongqing Iron & Steel as key anchors, the city has developed a full-spectrum manufacturing system encompassing R&D, production, and supply chain operations. In recent years, the Chongqing Municipal People's Government has introduced a series of strategic policies, including *the 14th Five-Year Plan for High-Quality Development of the Manufacturing Sector (2021-2025)* and *the 14th Five-Year Plan for the Development of the Digital Economy (2021-2025)*. These policies explicitly position AI as a key enabling technology for the transformation and upgrading of traditional industries. According to *the Roadmap to Smart Factory Development 2025*, Chongqing is actively exploring in-depth application scenarios of "AI + Intelligent Manufacturing" in fields such as the industrial internet, digital twins, and intelligent quality inspection. Efforts are underway to promote the construction of digital workshops and smart factories, enhance enterprises' intelligent manufacturing capabilities, implement a comprehensive self-assessment, and review mechanisms for the next-generation upgrade of intelligent manufacturing.

However, despite this progress, the development of Chongqing's "AI + Intelligent Manufacturing" sector still faces several challenges.

Challenge I: Dependence on External Sources for Foundational Technologies and High-End Equipment

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[6] *Open AI Research Report*

[7] *Gartner Report*

[8] *Wiseguy recruitment*

[9] *Institute of Digital Education, Chinese Academy of Education*

While Chongqing holds distinct advantages in the application of intelligent manufacturing, particularly in automotive production and equipment integration, there remains a significant reliance on external sources for critical foundational technologies such as core chips and industrial software. The city's capabilities in developing industrial foundation models and intelligent algorithms still require substantial improvement.

Challenge II: Insufficient Willingness and Capability Among SMEs for Digital Transformation

Chongqing is home to a vast number of manufacturing enterprises, the majority of which are SMEs. These companies typically lack a strong digital foundation, and efforts to promote AI adoption are hindered by high implementation costs, a shortage of suitable application scenarios, and technical barriers. These factors have become major obstacles to their digital transformation.

Challenge III: Structural Talent Shortages

Currently, Chongqing faces a significant structural gap in talent, particularly in two critical areas. First, there is a shortage of high-level professionals specializing in AI R&D. Second, the city lacks interdisciplinary talent who possess both a solid foundation in industrial operations and practical experience, as well as technical expertise in algorithms—individuals who can effectively bridge the gap between AI technologies and real-world manufacturing scenarios. This shortage of skilled professionals has become a major bottleneck, restricting technological breakthroughs and hindering the large-scale and in-depth application of AI across the manufacturing sector.

Chongqing should leverage its strengths and pursue a distinctive "AI + Intelligent Manufacturing" development path.

Unlike industrial layouts in cities such as Shanghai, Shenzhen, and Hangzhou, Chongqing possesses a vast automotive industrial system, ranking among the nation's leaders in notebook computer manufacturing (accounting for approximately one-third of the global annual output, according to statistics). These unique manufacturing resources provide a solid foundation for the large-scale application of AI. By 2027, it is projected that the city will have established a total of 30 new smart factories and 300 digitalized workshops. The intelligent transformation efforts led by industry giants have not only driven industrial upgrading but also provided valuable demonstration cases for "AI + Intelligent Manufacturing." Given these advantages, Chongqing should place strategic focus on high-end manufacturing sectors such as automotive, electronics and equipment manufacturing. The city is encouraged to continue implementing major/key sci-tech initiatives, with an emphasis on core technology applications including industrial foundation models, intelligent logistics, and digital twins. Accelerating the commercialization and industrialization of technological achievements will be essential to shaping a nationally influential "Chongqing Model" for intelligent manufacturing in Western China.

2. In spite of diverse "AI + Intelligent Manufacturing" applications scenarios, the supply and demand sides face multiple challenges

As AI technology advances and applications deepen, AI + Intelligent Manufacturing has gradually become an important component of AI application scenarios. The industry characteristics of being technology-intensive and data-intensive provide many application scenarios for AI technology. However, the manufacturing industry's demands for real-time responsiveness and reliability, the need for customization across diverse scenarios, and the weak data infrastructure in traditional manufacturing pose significant challenges for both AI developers and end-users.

2.1 Current Status

In addition to hardware infrastructure, the core AI ecosystem in the current Chinese market primarily consist of three business models: AI foundational model, AI platforms, and AI applications. AI foundational model refers to universal algorithm frameworks formed through massive data training, providing basic capabilities such as natural language processing, computer vision, and decision-making reasoning to support upper-layer application development. AI platforms provide application developers with full-lifecycle services such as data processing, model training, and deployment operations, reducing R&D costs and improving efficiency at the application layer. AI applications comprise intelligent solutions tailored for end clients to address specific business scenarios and needs, directly generating economic benefits while representing the segment with lower barriers to entry, the most players, and the richest application scenarios within the core AI ecosystem.

In AI applications, the manufacturing sector stands out as a technology-intensive and data-intensive industry. The complexity of its production processes, the precision of its equipment, and the vast volume of data it generates offer natural scenarios for AI deployment, positioning "AI + Intelligent Manufacturing" as one of the most dynamic and promising fields in current applications.

Technology-intensive features provide a tangible platform for AI technology implementation. The precise operation and control of high-end equipment in manufacturing require advanced technology, and AI algorithms help enterprises move away from relying on manual experience, optimizing equipment performance through more scientific and intelligent algorithms. Data-intensive characteristic supplies fuel for AI training. Multi-dimensional information such as equipment operation data, product inspection data, and supply chain data in manufacturing offers rich samples for AI model training. The real-time and continuous nature of the data also imposes higher reliability and stability on AI applications.

Mapping "AI + Intelligent Manufacturing" application scenarios to the three key value chain models of manufacturing enterprises (as shown in Figure 3), we can find that each value chain link has application cases, highlighting AI's role as a driving force or innovation and transformation across the manufacturing life-cycle.

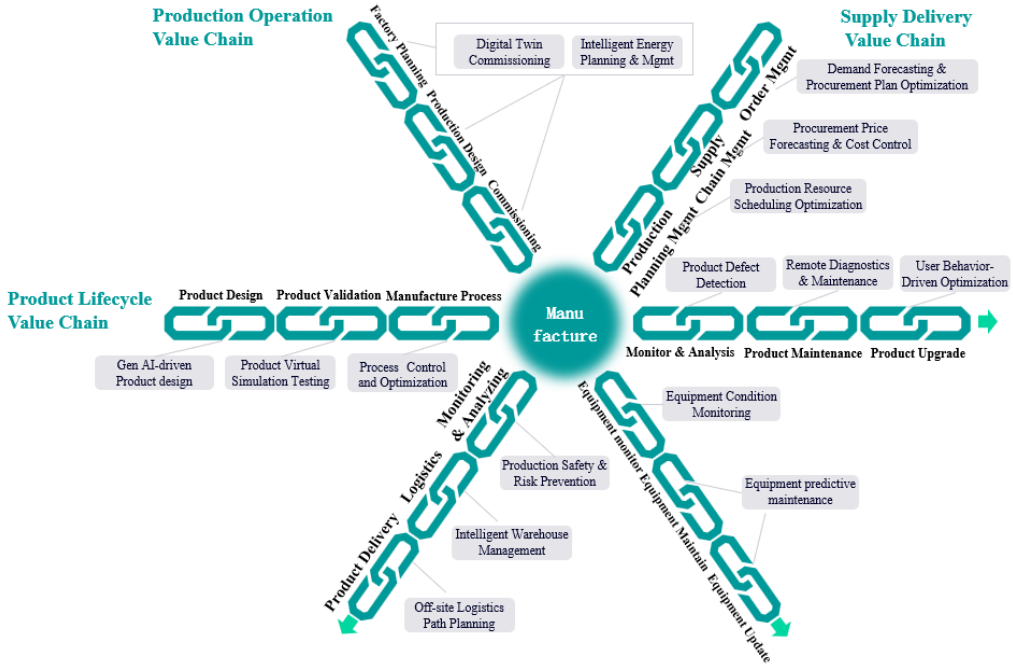

Figure 3: AI + Intelligent Manufacturing Application Scenarios

1) Product Lifecycle Value Chain

The product lifecycle value chain covers the complete closed loop from product design to manufacturing processes and product upgrades. It is the core of enterprise value creation and one of the core components of "AI + Intelligent Manufacturing" applications. Examples of AI + Manufacturing applications include:

- Product Design: Generative AI-driven product design assistance. Aiming at the long industrial design cycle, generative AI and industrial vertical large language models automate code and 3D drawing generation, significantly enhancing design efficiency.

- Product Validation: Virtual simulation testing for products. To overcome extended validation cycles and high costs, AI and digital twins enable high-precision modeling and multi-physics co-simulation, reducing verification costs and accelerating R&D through virtual testing.

- Manufacturing Process: Intelligent process control and optimization. For complex manufacturing processes reliant on manual parameter adjustments, AI models establish real-time monitoring feedback mechanisms and adaptive control systems to achieve dynamic closed-loop process optimization.

- Product Performance Monitoring & Analysis: Quality control and defect detection. For inefficient product inspection and micro-defect identification challenges, machine vision and edge computing enable intelligent quality monitoring, defect recognition, root-cause analysis, and quality improvement recommendations.

- Product Maintenance: Remote fault diagnosis and operational services. To resolve vague customer fault descriptions and slow maintenance responses, natural language processing parses work orders, matches fault solutions automatically, and guides on-site repairs remotely, enhancing operational efficiency and reducing service costs.

- Product Upgrade: User behavior-driven feature optimization. By analyzing product operational data and user feedback via NLP and deep learning, AI generates feature enhancement proposals, shortening iteration cycles and creating a positive feedback loop for continuous improvement.

2) Production Operation Value Chain

The production operation value chain includes factory planning, production line design, engineering commissioning, equipment monitoring and analysis, equipment maintenance, equipment upgrading, etc. It is the key value chain for enterprises to pursue production efficiency improvement and production cost reduction. Examples of AI + Manufacturing applications include:

- Factory Planning, Production Line Design, and Engineering Commissioning:

- Digital twin production line design and commissioning. To address challenges such as prolonged factory construction cycles, layout optimization difficulties, and weak dynamic response capabilities of production lines, technologies such as 3D modeling and process/logistics simulation are utilized. These simulate multi-scenario production scheduling, dynamically coordinate equipment, material, and labor requirements, shorten factory construction or renovation cycles, and enhance scheduling efficiency and production line flexibility.

- Intelligent energy planning and management. To tackle high energy consumption and costs in factories, energy monitoring systems and load forecasting technologies are deployed. These conduct modeling, simulation, and parameter optimization for high-energy-consumption production lines, achieving integrated energy management and holistic optimization to reduce comprehensive energy consumption per unit output value.

- Intelligent Equipment Condition Monitoring: To address challenges such as untimely fault alerts and high maintenance costs, sensor-collected real-time operational data is analyzed via machine learning for precise equipment status assessment, generating condition reports and maintenance recommendations to enhance operational reliability.

- Predictive Maintenance: To address critical pain points, including high unpredictability of equipment failures and substantial downtime costs, this solution deploys predictive maintenance models. These models precisely identify failure risks and residual lifespan, enabling dynamic maintenance planning that minimizes operational costs caused by unplanned downtime.

3) Supply Delivery Value Chain

Supply delivery focuses on the full cycle from order acquisition to product delivery. It is the process for enterprises to deliver customer value and a link where "AI + Intelligent Manufacturing" cases are widely applied. Examples of AI+Manufacturing applications include:

- Order Management: Demand forecasting and procurement plan optimization. To address issues such as inventory backlog or shortages caused by inaccurate demand prediction, machine learning models analyze historical sales data and market trends to precisely forecast order volumes and raw material requirements.

- Supply Chain Management: Procurement price forecasting and cost control. To tackle challenges in predicting price fluctuations and cost management, AI algorithms accurately forecast raw material price trends, providing a scientific basis for procurement budgeting to maximize cost efficiency.

- Production Planning Management: Production resource scheduling optimization. For inefficient resource allocation and frequent delays, algorithms optimize equipment, labor, and material allocation, enabling intelligent production scheduling. Real-time monitoring dynamically adjusts plans to minimize disruptions, enhancing efficiency and stability.

- Production Status Monitoring & Analysis: Safety production and risk prevention. To counter delayed hazard identification and risk assessment, machine vision establishes safety monitoring systems. Risk assessment models dynamically identify threats and generate targeted prevention plans for continuous safety improvement.

- Warehousing and Logistics: Intelligent warehousing management. To resolve low throughput and high inventory costs, inventory optimization models predict stock needs. Smart warehouse systems automate material handling, storage, and picking, improving turnover rates and space utilization.

- Product Delivery: External logistics route planning. For suboptimal routes and inefficient transport, big data analyzes road conditions and traffic flow to dynamically optimize paths, minimizing delivery time and costs while enhancing distribution efficiency.

2.2 Key Challenges

Although manufacturing offers diverse application scenarios, the development and implementation of "AI + Intelligent Manufacturing" still face numerous pain points such as inadequate technical adaptability and inconsistent data quality. These issues constrain the deep integration and widespread adoption of AI in manufacturing, urgently requiring collaborative efforts to overcome them, thereby further advancing the intelligent transformation of the manufacturing sector.

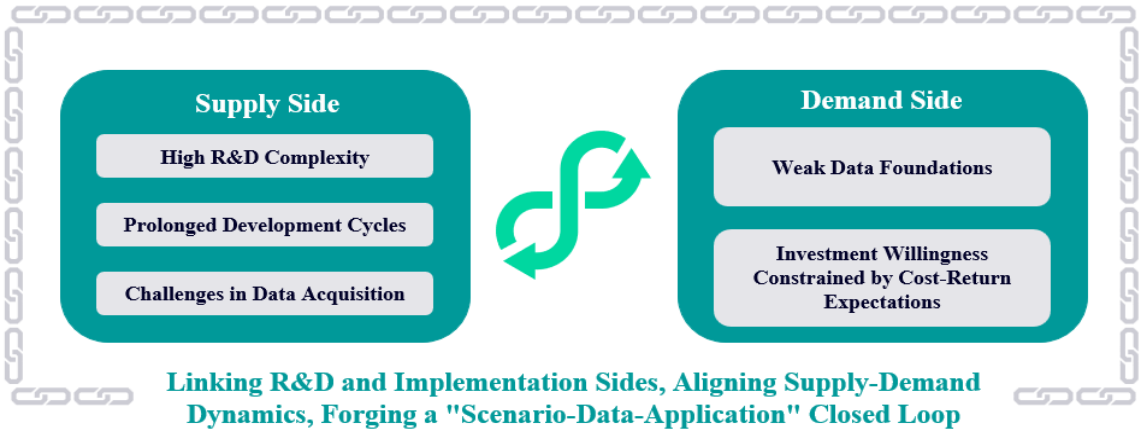

Figure 4: AI + Intelligent Manufacturing Application Pain Points

Supply Side: High R&D Difficulty, Long Development Cycles, and Data Acquisition Challenges

The complexity of manufacturing scenarios imposes extremely high requirements for the R&D of AI applications. Core manufacturing processes (such as welding and stamping) often require precise decision-making in an extremely short time, placing stringent demands on the real-time performance and reliability of AI applications. Moreover, process manufacturing (such as chemical and metallurgical industries) involves complex physical and chemical reactions. The coupling of multiple processes makes global optimization highly challenging. These requirements necessitate deep innovation in algorithm optimization and system architecture design while simultaneously adapting to the specific constraints of specific scenarios, significantly increasing R&D difficulty.

The diversity of manufacturing sub-sectors leads to prolonged customization cycles for AI applications and insufficient economies of scale. Within the manufacturing industry, even among different enterprises in the same sector, significant differences may exist in production processes, equipment types, and management objectives. Current general-purpose large models struggle to meet the differentiated demands of manufacturing scenarios. Most applications still adhere to a “one-scenario-one-model” customized development approach, resulting in extended development cycles, high costs, and difficulties in achieving large-scale rapid deployment and application.

Data acquisition challenges are also a key factor constraining the development of “AI + Intelligent Manufacturing” applications. Manufacturing data often involves core corporate secrets—such as raw material formulations and process parameters—that are difficult to obtain through public channels. Meanwhile, training AI models requires substantial data support. Insufficient data leads to sub-optimal model training outcomes, hindering the development of efficient and accurate applications and thereby impeding R&D progress.

Demand Side: Weak Data Foundations of Traditional Manufacturing Enterprises and Low Investment WillingnessConstrained by ROI Expectations

Manufacturing data is typically scattered across equipment, systems, and supply chain segments, character-

ized by severe data silos, lack of standardization, and inconsistent data quality. These factors impede data integration and sharing, undermining the effective utilization of data and significantly hindering AI model training and application deployment.

Moreover, for most manufacturing enterprises, deploying and maintaining AI applications incurs high costs with prolonged payback periods. Substantial investments are often required for high-performance computing equipment, sensors, and other hardware, while customized AI development entails significant R&D expenses. For many SMEs, the combination of high costs and uncertain returns creates economic pressure, stifling the adoption and implementation of AI technologies. Consequently, hesitancy in demand-side deployment deprives the supply side of real-world scenarios and data support, hampering solution validation and iteration.

In summary, "AI + Intelligent Manufacturing" scenarios continue to expand across product lifecycles, production operations, and supply delivery value chains, demonstrating immense potential. However, persistent challenges on both supply and demand sides constrain development, deployment, and iteration. For Chongqing, "AI + Intelligent Manufacturing" is undoubtedly a strategic advantage in the development of its manufacturing sector. The city should fully leverage its strengths in equipment manufacturing and the diversity of its application scenarios to actively bridge and align the supply and demand sides of innovation, connecting R&D with real-world industrial needs and overcoming existing barriers. By building a closed-loop ecosystem of "scenarios-data-applications," Chongqing can foster resource integration and collaborative innovation. This will accelerate the deep integration of AI technologies into the manufacturing sector, driving industrial upgrading and transformation at an enhanced pace.

3. Benchmarking and Best Practices

3.1 Benchmarking of AI Development Paths in Various Countries

3.1.1 China

China's AI industry adopts an open-source development model characterized by "government guidance + industrial integration". To accelerate the application of AI technology, China places a strong emphasis on the guiding and supportive role of the government. From the central to local governments, China accelerates the construction of an AI industry ecosystem through the establishment of special funds, the provision of preferential policies, and the encouragement of corporate participation in R&D, creating the best possible environment for industry development. Chinese enterprises also leverage their strengths while addressing weaknesses. Although they lag in hardware and basic research, Chinese enterprises have demonstrated robust capabilities in integrating AI industry chains, promoting the deep integration of AI into core industries such as manufacturing, healthcare, and security, while actively promoting the convergence of AI technology with practical applications to shorten R&D-to-implementation cycle.

The choice of China's AI development path is based on comprehensive planning, as well as the important

support provided by achievements in various fields of scientific research and industry. For example, China has technologies such as ultra-high voltage power transmission for efficient data center power allocation, long-distance low-latency data transmission, abundant natural cooling sources from its vast geography, and the ability to build underground data centers. These forward-looking layouts and collaborative capabilities in the field of science and technology form the cornerstone of China's AI industry.

3.1.2 United States

The United States currently leads the world in algorithm innovation, computing infrastructure, data ecosystems, and application implementation. To maintain its advantage and expand its monopolistic position, the United States adopts a closed-source development model.

On one hand, the U.S. development path focuses on maximizing its strengths and continuously achieving breakthroughs in basic research and commercialization. This is achieved through large-scale investment in basic research and the commercialization of AI SaaS, ensuring its leading position in the global AI field. On the other hand, the United States attempts to suppress industrial innovation by emphasizing the originality of technology and restricting open-source practices. In 2024, the U.S. government issued the "AI National Security Memo", which aims to strengthen the role of AI in national security, defense, and international competition, while restricting the export of AI chips and high-end computing resources to China to maintain its technological edge.

3.1.3 Europe

Compared to other regions, Europe's unique aspect in the AI industry is its high emphasis on ethics and human rights, as well as its regulatory approach. Europe follows a development path characterized by "emphasis on human rights + robust regulation", which enhances its influence and discourse power in the AI field while protecting public interests. The EU's "AI Act", which came into effect in July 2024, classifies AI systems according to their risk levels as unacceptable risk, high risk, limited risk, and minimal risk, thereby establishing the world's first systematic AI governance framework.

While other European countries focus more on governance systems, Germany, as a manufacturing powerhouse, has a strong demand for AI applications in energy and manufacturing management. In the energy sector, AI is used to optimize power generation and electricity distribution. In the manufacturing field, AI is applied for production line monitoring, inventory management, and predictive maintenance, gradually forming a technological barrier in specific vertical scenarios.

3.1.4 Comparison of AI Development Paths in Various Countries

Currently, the global AI industry has formed a tripartite development pattern centered around China, the United States, and Europe. However, different countries and regions have developed unique AI development paths based on their respective information technology environments, economic levels, and industrial resource

allocation. China emphasizes government guidance and industrial integration, emerging as a latecomer in the AI industry. The United States adopts a closed-source path, aiming to maintain its leading position through AI commercialization and emphasis on technological originality. Europe, on the other hand, focuses on developing an AI governance system centered on human rights and regulation, aiming to gain a say in international standards despite its slower pace of innovation.

Dimension	China	United States	Europe
Strategy Direction	Government Guidance + Industrial Integration (Open-Source Path)	Technology Originality + Commercial Application (Closed-Source Path)	Human Rights Focus + Regulatory Perfection (AI Governance Path)
Technical Advantages	Scenario-Driven Innovation Hardware Substitution	Foundation Model Dominance Chip Monopoly	Privacy-Preserving Computing Industrial AI
Government Investment Focus	Computing Infrastructure & Domestic Substitution	Fundamental Research & Enterprise Subsidies	AI Factories & Data Ecosystems
AI Regulation	Safety First & Agile Governance	Industry Self-Regulation & Fragmented Legislation	Most Stringent Global Compliance
Key Challenges	Underdeveloped Software Ecosystem & Advanced Chips	Geopolitical Risks Global Standard Discourse Competition	Lagging Innovation Pace High Regulatory Costs

Table 1: Comparison of AI Development Paths in Various Countries

As an inland gateway for opening-up and a center of advanced manufacturing, Chongqing holds unique advantages in promoting the deep integration of AI with the manufacturing sector. In response to the global wave of intelligent transformation, Chongqing should anchor its efforts in its leading industries, such as automotive, electronics, and equipment manufacturing, while drawing on advanced international experience from Europe and the United States. By doing so, the city can establish a differentiated development path with “AI + Intelligent Manufacturing” at its core.

At the technical level, Chongqing should closely align with the “4+16” Framework for Science, Technology, and Innovation and adopt a dual-track approach of “open-source ecosystems + independent innovation.” The city must accelerate research and development in key technologies such as industrial foundation models, intelligent quality inspection, and digital twins, with the goal of enhancing local algorithmic capabilities and advancing industrialization. Drawing lessons from the United States in intellectual property protection and the commercialization of research outcomes, Chongqing should improve its innovation incentive policies. Furthermore, the city should promote collaborative research among the four major laboratories (Jinfeng, Jialing River, Mingyue Lake, and Guangyang Bay) alongside enterprises, universities, and research institutions to build a secure, self-reliant AI technology system.

In terms of governance and standards, Chongqing should monitor policy trends in data security and cross-border data flows across Europe and the United States. It is imperative to establish an AI ethics and compliance review mechanism tailored to intelligent manufacturing scenarios, ensuring the safety and sustainability of digital applications. Leveraging the Chengdu-Chongqing Twin-Hub Mega-Region and the New International Land-Sea Trade Corridor, the city should guide the development of model smart factories through targeted policies and

demonstration projects. This will help generate regional influence, attract global innovation resources, and drive the high-quality development of "AI + Intelligent Manufacturing."

3.2 AI + Intelligent Manufacturing Best Practices

As a global leading technology company, Siemens has been actively involved in the integration of AI + manufacturing for many years. With the continuous advancement of technology and the in-depth development of applications, Siemens has proposed a new development mission to empower manufacturing development with AI, creating an industrial-level AI that is "reliable and safe", "accessible to all", and "driving corporate transformation goals".

In the field of reliability, Siemens Senseye Predictive Maintenance System uses AI to analyze data to detect anomalies, providing early warnings and maintenance recommendations to engineers. It also employs generative AI conversational functions to make predictive maintenance simpler and more intuitive while adhering to safety standards. Additionally, Teamcenter AI Chat uses large language models to help users quickly retrieve information while ensuring that search behavior remains within a secure framework and complies with company access policies.

In terms of accessibility, Siemens Mendix low-code platform combines AI and machine learning to provide digital assistant functions for developers. These assistants can answer application development questions through natural language conversations and generate development suggestions. Furthermore, Siemens Inspecto system addresses the challenges of high industry experience and data requirements in quality inspection processes, as well as the high costs associated with deploying automated systems. By leveraging AI and machine vision technologies, it offers an intelligent, easy-to-set-up, and maintainable industrial visual inspection system, lowering the barrier to entry and making AI accessible to everyone.

In driving corporate digital transformation, Siemens SIWA Leak Finder targets the economic losses and environmental issues caused by water leakage in water distribution networks. It uses AI to analyze flow data in real-time, achieving precise identification and localization of leakage points within a 200-meter range, reducing water waste, and helping companies achieve low-carbon goals. Additionally, Siemens has introduced an enhanced AOI solution that combines machine learning to address the high rate of false alarms. This AI-driven solution reduces false alarms and manual operation time, saving resources and costs while improving quality and productivity.

In empowering SMEs to undergo digital transformation, Siemens leverages its deep industry expertise and AI capabilities to provide comprehensive and efficient online consulting and diagnostic services. These services overcome the limitations of time and geography by offering a "digital health check" that helps enterprises accurately assess their status and systematically plan practical and achievable upgrade paths.

The core strengths of this service include the creation of dynamic digital profiles for each enterprise, enabling continuous tracking of their transformation journey. It also supports a highly customizable evaluation framework

that is compatible with and intelligently interprets multiple mainstream standards, such as the Smart Manufacturing Maturity Model and SMEs Digitalization Assessment, delivering unified and objective results that eliminate ambiguity caused by differing evaluation criteria.

Based on diagnostics, the service generates professional and highly consistent improvement recommendations, ensuring both reliability and practical implementation. Additionally, Siemens provides an expandable pool of digital solutions that matches verified technical offerings and product systems to the specific pain points and goals of each enterprise, significantly reducing the risks associated with solution selection and implementation. Ultimately, the system produces diversified and visualized maturity reports that clearly present an enterprise's status and development trends across multiple dimensions—such as production, supply chain, and energy management. These insights offer reliable decision-making support for management teams, enabling SMEs to invest strategically, transition steadily, and secure a competitive edge in the digital future.

In addition, this article will also provide detailed introductions to the world's first industrial-level generative AI, Industrial Copilot, the SiePA system, which is led by China in research and development as a core product of Siemens, and Siemens' progress in industrial foundation model research.

3.2.1 Industrial Copilot: The World's First Industrial-Level Generative AI

There are significant differences between industrial AI and terminal AI in terms of data processing, application scenarios, security and trustworthiness, and scalability. On one hand, industrial scenarios involve not only traditional image and text data but also a large amount of time-series data generated by sensors. The quality and availability of data have always been a constraint on the large-scale application of AI. On the other hand, traditional industrial AI solutions rely heavily on domain and modeling experts, often requiring customized models for each scenario. These solutions face challenges in scalability and knowledge integration, making it difficult to form standardized products for large-scale application.

To address these challenges, Siemens collaborated with Microsoft to launch the world's first industrial-level generative AI product, Industrial Copilot, at Hannover Messe. Industrial Copilot empowers customers across the entire value chain, from design planning, engineering implementation to operations management, and service support, through natural language conversations that automatically generate engineering code and maintenance suggestions. Currently, Industrial Copilot has introduced two major functional modules: one for engineering design and the other for industrial maintenance. The former is expected to increase engineering progress and efficiency by 10% to 40%, while the latter provides comprehensive insights into system operations and is estimated to improve maintenance efficiency by 25%. Siemens Industrial Copilot is not only an engineering assistant, machine language translator, but also a production assistant and training instructor for workshop workers, promoting the large-scale application of generative AI and making AI truly accessible to all.

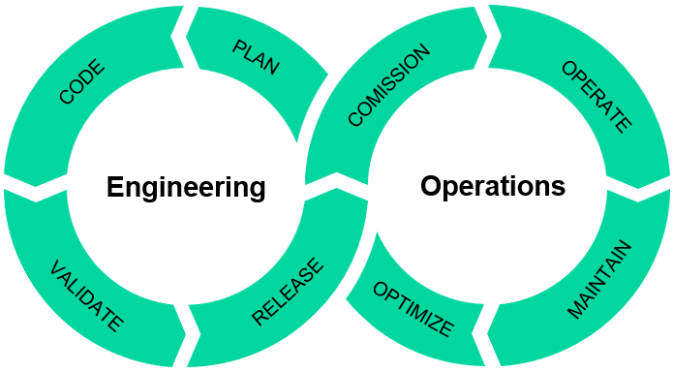

Figure 5: The Two Functional Modules of Industrial Copilot

The engineering design module of Industrial Copilot is now integrated with Siemens Totally Integrated Automation software, TIA Portal. It helps engineers generate basic virtual tasks and code for programmable logic controllers (PLCs) through conversational interfaces, automatically handling repetitive tasks. This reduces the workload of engineering teams while ensuring that complex engineering designs are error-free, thereby shortening development time, improving quality, and increasing productivity. The engineering design module has been deployed in companies such as Schaeffler, a global automotive supplier, and Thyssenkrupp, a German industrial giant, helping engineers increase code generation speed and reduce error rates.

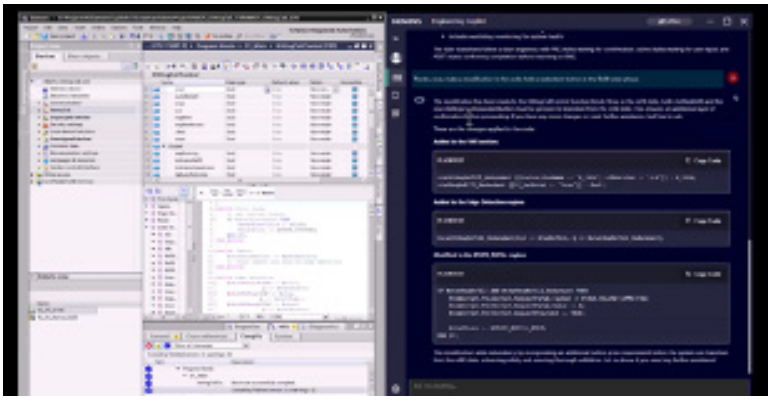

Figure 6: Thyssenkrupp Group Utilizes Industrial Copilot to Automatically Generate Engineering Code

The operational module of Industrial Copilot combines intelligent maintenance guidance with predictive failure functions to cover the entire lifecycle from reactive maintenance to preventive maintenance, intelligent fault diagnosis, and recommendations. Through an interactive chatbot system, it supports operators and maintenance engineers in identifying and resolving equipment issues and provides appropriate guidance and suggestions during production processes. Additionally, this module leverages generative AI-driven insights to predict failures in advance, maximizing the time equipment operates without faults. This module has been implemented in companies such as Klenk, a well-known German coating and laminating equipment manufacturer, and Siemens Erlangen factory. In the future, the Chinese research and development team will customize the standard module for local market. The team will collaborate with pilot customers and partners to advance the development of industrial gen-

erative AI assistant solutions in multiple scenarios, including process parameter optimization, production process control, production scheduling, and material sorting and distribution.

Figure 7: Krunat Corporation utilizes Industrial Copilot to address equipment failures.

3.2.2 SiePA: Siemens Predictive Analytics System

The Siemens Predictive Analytics System (SiePA) is an intelligent predictive maintenance diagnosis system for the industrial field. The system was jointly developed by the Siemens China R&D team, in collaboration with global resources from Germany, the United States, and other countries, and was first released in 2022. Currently, SiePA mainly consists of two modules: one for predictive maintenance of equipment management and the other for predictive control of production management. Statistics show that the application of SiePA can help customers achieve a 20.25% reduction in equipment maintenance rates, a fault classification accuracy rate as high as 95%, 3.85% increase in sealed life, 45.15% reduction in spare parts redundancy rate, and effectively reduce the frequency of unplanned shutdowns and risks caused by insufficient operating experience. SiePA, led by the Siemens China R&D team, has become one of the three core products of Siemens global process automation software business due to its effectiveness and reliability, and has been deployed in many countries around the world.

The predictive maintenance module for equipment management in SiePA assesses the condition of operating equipment to predict and warn of failure risks, provide intelligent diagnostics, and offer professional maintenance suggestions and solutions. After several years of development, this module has become a standardized product. However, during the promotion of SiePA in the Chinese market, the team found that many Chinese manufacturing companies are hesitant to adopt AI applications due to high investment costs and long payback periods. To attract more companies to try AI applications and promote the implementation and scaling of AI + manufacturing applications, Siemens China launched the plug-and-play “lightweight” AI predictive analytics application, SiePA Lite, in March of this year. SiePA Lite provides templates for common equipment types and diagnostic data models for common failures, enabling systematic monitoring of equipment status and real-time tracking of equipment usage. Moreover, SiePA Lite allows users to deploy AI applications with only 1/5 of the investment, and since its launch, more than 30 partners have expressed strong interest in cooperation, demonstrating the market’s urgent demand for lightweight AI applications.

Figure 8: SiePA Lite - Lightweight AI Predictive Analytics Application

The SiePA predictive control module, oriented towards production control, integrates AI technology to comprehensively consider the impacts of various elements in the process section. It recommends the optimal process section parameter control strategies for manufacturing enterprises, achieving cost reduction and efficiency improvement while supporting sustainable development. This helps companies realize their digital transformation goals. Currently, Siemens has combined industry experience with AI technology to create customized solutions for industries such as manufacturing, petrochemicals, cement, and water utilities. For example, in the water pump industry, pump scheduling heavily relies on manual experience, which cannot easily adapt to the frequently changing water supply demands. The SiePA Optimization for Digital Pump Station (DPS) solution addresses this issue. By obtaining the KPIs from the water plant's automation control system and real-time production scheduling requirements from the municipal water utility dispatch center, it uses the optimal AI algorithm to automatically calculate the best pump group configuration for multiple pumps. This ensures that each pump operates in its optimal state, thereby maximizing resource utilization efficiency.

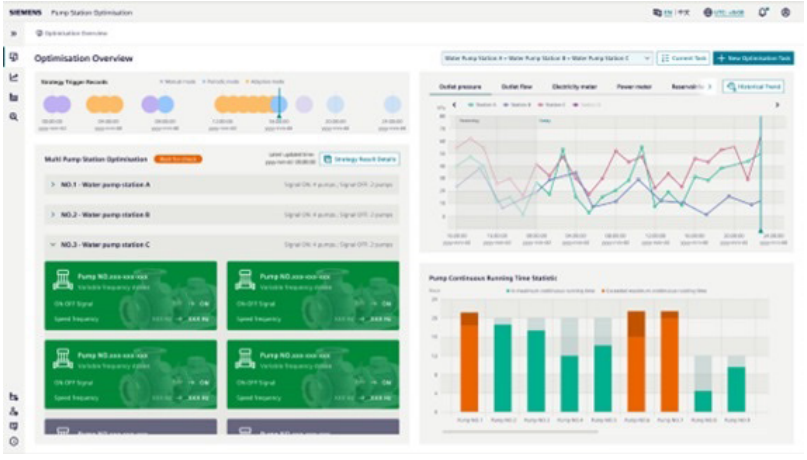

Figure 9: Siemens Predictive Analytics System, the SeiPA AI Forecasting Model

3.2.3 Industrial Time-Series Foundation Model

In AI foundational models, leveraging Siemens accumulated strengths in industrial data, the Chinese team has taken the lead in independently developing and creating the first time-series foundational model, GTT 1.0. This model, equipped with 300 million parameters, was trained on a large-scale, diverse dataset comprising 35 billion high-quality time-series samples, spanning multiple domains such as manufacturing, finance, transportation, buildings, healthcare, and energy. GTT 1.0 demonstrates exceptional performance in zero-shot multivariate time-series forecasting, capable of making accurate predictions without additional training for specific scenarios. This enables it to outperform existing state-of-the-art supervised learning models in various benchmark tests. It effectively addresses time-series analysis issues in industrial settings, such as trend forecasting and anomaly detection, facilitating rapid understanding and analysis of industrial data, as well as the large-scale application of industrial AI solutions.

Currently, the Chinese R&D team is integrating this model into Siemens product portfolio to enhance the performance and scalability of industrial AI products. Future plans include the launch of a user application portal similar to ChatGPT, offering zero-shot prediction and model fine-tuning capabilities. This will allow users to customize the model to meet specific needs through interactions with an industrial time-series foundational model agent.

3.3 Innovation Ecosystem Best Practices

3.3.1 Siemens Xcelerator Empowering China's Intelligent Manufacturing and Green Transformation

In 2022, Siemens launched Xcelerator, an open digital business platform for the Chinese market. This initiative partners with industry ecosystem players to identify industrial application scenarios and streamline industrial data flows. Its core mission is accelerating the generalization and scaling of industrial AI through the development of a shared community platform.

In November 2023, Xcelerator initiated the "Stellar Program". This initiative opens the Siemens platform, integrating cutting-edge technologies from ecosystem partners with Siemens software, hardware, and automation solutions. Together, they deliver solutions that more closely address end-user needs.

In Changshu City, Siemens has partnered with Suzhou Land Group to advance the development of smart parks and the digital transformation of the manufacturing sector within the Changshu National New & High-tech Industrial Development Zone. This park serves as the city's first pilot project for the renewal and transformation of aging industrial zones. Through flagship smart park initiatives and the application of intelligent building IoT technologies, Siemens and Land Group are jointly working to establish China's first Siemens Smart Park, contributing to the realization of the country's dual carbon goals (carbon peak and carbon neutrality).

This collaborative platform has accelerated the alignment between Germany's "Industry 4.0" and China's Smart Manufacturing Strategy. Additionally, Siemens and Land Group have co-developed the Siemens Xcelerator Yangtze River Delta Technology Innovation Enablement Center, which aspires to become a comprehensive digital business service platform. The center aims to foster a diversified ecosystem, deliver targeted digital empowerment, deepen international cooperation, stimulate technological innovation, and drive industrial upgrading.

Hongqi Instrument, recognized as a "little giant" enterprise that use specialized, sophisticated technologies to produce novel or unique products, faces the challenge of improving energy efficiency and reducing operational costs in the context of a changing economic environment. The Smart ECX intelligent energy and carbon management system, which is available on the Siemens Xcelerator platform, offers a core solution to these challenges by enabling the quantifiable management of energy consumption.

Smart ECX integrates seamlessly with Hongqi Instrument's MES solution developed by the New Core Cloud Technology, providing transparent and accessible energy consumption data to support the monitoring and optimization of energy usage. The solution comprises key modules such as core data services, energy audits, and carbon verification and certification, thereby establishing a comprehensive framework for carbon footprint management and operational excellence. With its cost-effective design, the system is widely applicable and particularly well suited to the needs of SMEs.

3.3.2 University-Industry Collaboration Driving Sci-Tech Innovation Ecosystem

In 2021, Siemens Technology launched the Research and Innovation Ecosystem (RIE) Program, integrating three innovation entities into its R&D ecosystem: industry-driven innovation ecosystem, knowledge ecosystem anchored by universities and research institutions, and entrepreneurship ecosystem centered on startups and incubators. Under the RIE framework, these entities have deepened collaboration across technology, platforms, industry partnerships, and talent development, establishing a Sino-German model for cultivating digital talent and building innovation ecosystems in the evolving development landscape.

Leveraging its expertise in smart manufacturing and engineering education, Siemens collaborates with universities on key themes including data analytics & AI, simulation & digital twins, and automation & robotics. Through partnerships with global academic institutions, Siemens advances research in industrial vertical AI models, empowering universities to develop next-generation AI talent and accelerate high-impact technological innovation.

- **Siemens-Tsinghua-Zhipu Tripartite Innovation Ecosystem: Shaping the Future of Large Language Models**

Siemens' collaboration with Tsinghua University dates to 1995, culminating in the 2020 launch of the Joint Center for Industrial Intelligence and IoT (JCIIOT) to pioneer research in AI, simulation, and edge computing. Zhipu AI—an LLM startup spun off from Tsinghua's Department of Computer Science—secured early-stage tech-

nical partnership with Siemens through this strategic platform, forging a tripartite Siemens-Tsinghua-Zhipu innovation ecosystem.

At the 7th China International Import Expo, Siemens and Zhipu announced the integration of Zhipu's GLM algorithm services into Siemens Xcelerator API World. The deployment offers APIs including ChatGLM (long-text conversational QA) and CogView (text-to-image generation), enabling developers to embed these capabilities into diverse applications.

For Siemens, this expands its open ecosystem, delivering higher-quality, cost-effective digital solutions for SMEs. For Zhipu, industrial implementation accelerates technology validation and market growth. For Tsinghua, the collaboration commercializes academic research while amplifying its AI influence. This tripartite model exemplifies synergistic innovation. Siemens will continue bridging academia and startups to unlock ecosystem value.

4. Recommendation

Recommendation 1: Promote Applications – Forge Chongqing's AI Development Path Centered on "AI + Intelligent Manufacturing"

Chongqing should leverage its industrial strengths in automotive, electronics, and equipment manufacturing to position "AI + Intelligent Manufacturing" as the focus of its AI industry development. Emphasis should be placed on the deep application and demonstration of key technologies such as industrial foundation models, intelligent quality inspection, and digital twins. It is recommended that the Chongqing Municipal People's Government take the lead in establishing a Intelligent Manufacturing Application Pilot Program in collaboration with leading enterprises, local AI companies, and research institutions. This initiative should focus on developing a series of exemplary "AI + Intelligent Manufacturing" projects that can serve as models with strong demonstration value and scalability for broader adoption.

In addition, the city could establish a "Chongqing AI + Intelligent Manufacturing Application Promotion Center," designed to showcase AI achievements to manufacturing enterprises and serve as a platform for demand-supply matching and technical exchange. Through supportive policies (such as equipment purchase subsidies, incentives for technological upgrades, and tax relief), the government can encourage enterprises to actively pilot intelligent transformation projects. These measures will help reduce the cost and risk of AI deployment for SME manufacturers, foster a city-wide demonstration effect, and accelerate the overall transformation and upgrading of Chongqing's intelligent manufacturing sector.

Recommendation 2: Build Ecosystems – Develop an AI Innovation Ecosystem and Optimize Mechanisms for Industrial Collaboration and Technology Commercialization

Chongqing should establish a comprehensive AI innovation ecosystem spanning R&D, application, services,

and talent development, with the government playing a guiding role, enterprises serving as key drivers, and research institutions providing strong support.

For one thing, it is recommended that Chongqing leverage the Siemens Xcelerator platform and its extensive industrial expertise, while integrating the unique resources of the local industrial value chain. By connecting data, equipment, and algorithm resources across upstream and downstream enterprises, this approach aims to break down data silos in manufacturing scenarios and build an open, shared industrial internet infrastructure. This will enable the efficient and deep integration of AI algorithms into industrial production environments.

For another, Chongqing should fully capitalize on the collaborative advantages of the Chengdu-Chongqing Twin-Hub Mega-Region. By partnering with Chengdu's high-tech enterprises, universities, and industry associations, the two cities can jointly pursue breakthroughs in key technologies and carry out cross-regional application demonstrations. This collaboration would help create a dynamic regional intelligent manufacturing ecosystem, promoting optimized resource allocation and the free flow of innovation elements.

To address the specific challenges faced by SME manufacturers in digital transformation, Chongqing may consider introducing "Smart Factory Innovation Vouchers" or dedicated funding programs. These initiatives would incentivize technology providers to offer SMEs modular, cost-effective, and rapidly deployable AI solutions—ultimately accelerating the commercialization and practical application of innovative outcomes.

Recommendation 3: Nurture Talent – Build an Interdisciplinary Talent System for "AI + Intelligent Manufacturing" and Promote Joint Industry-University-Research Training

A shortage of high-level technical talent is a key constraint hindering the deep integration of AI and manufacturing in Chongqing. It is recommended that the city leverage its leading higher-education institutions, such as Chongqing University and Southwest University, to jointly establish "Talent Training Base for AI + Intelligent Manufacturing Talent" in partnership with major industry players like CHANGAN Automobile, BOE Technology Group, and SERES. The training base should focus on delivering hands-on courses and collaborative industry-university-research projects in areas such as industrial AI, data analytics, digital twins, and intelligent quality inspection. The objective is to cultivate highly qualified interdisciplinary professionals who are not only proficient in algorithmic technologies but also possess a deep understanding of manufacturing processes and scenarios.

Additionally, it is advised that Chongqing establish a "Chongqing Institute of Intelligent Manufacturing" or an "AI Technical Training Center" to provide systematic retraining and professional certification services for in-service engineers and technical personnel from SMEs. This initiative would help traditional manufacturing professionals rapidly adapt to the evolving skill requirements of intelligent transformation.

To further enhance talent attraction and innovation capacity, Chongqing should actively encourage leading domestic and international AI enterprises and research institutions to set up R&D centers or innovation labs in the city. Hosting innovation competitions, industry summits, technology roadshows, and similar events will help

foster a vibrant innovation ecosystem, strengthen Chongqing's talent pool, and solidify its leadership position in technology development across Western China.

5. Conclusion

Based on the analysis and benchmarking, we propose that Chongqing prioritize "AI + Intelligent Manufacturing" applications as its core focus, fully unleashing the potential of AI-enabled intelligent manufacturing upgrades to establish a full-chain innovation ecosystem that spans infrastructure, technology R&D, flagship applications, and scaled empowerment.

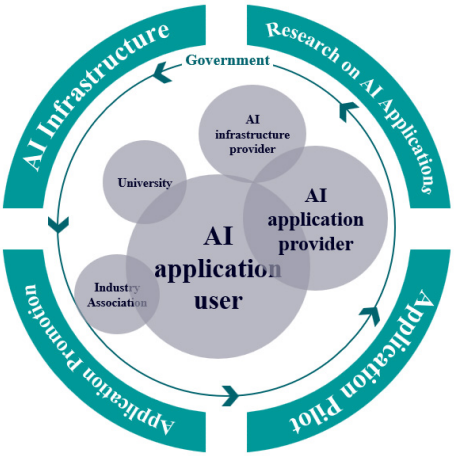

Figure 10: Full-Chain Innovation Ecosystem

The full-chain concept encompasses the entire lifecycle—from AI infrastructure construction and fundamental/applied research to benchmark AI application projects and scaled deployment.

AI Infrastructure Development: Strategically plan and coordinate the construction of computing power centers, industrial internet platforms, and data resource repositories. Strengthen capabilities in computational power provision and industrial data integration. By building an efficient, secure, and open infrastructure network, provide robust technical support and data assurance for the implementation of "AI + Intelligent Manufacturing" application scenarios.

Fundamental and Applied Research: Support local universities and research institutions in conducting collaborative research on critical technologies in industrial AI. Focus on breakthroughs in cutting-edge areas such as industrial foundation models, intelligent quality inspection, and digital twins. Promote deep integration between basic research and industrial needs to enhance both technological innovation capacity and overall industry competitiveness.

Flagship Application Projects: Rely on leading enterprises in key sectors to develop a series of representative and demonstrative smart factory projects. These projects will not only drive the practical adoption of AI technol-

ogies in manufacturing processes but also serve as replicable models to guide intelligent upgrading across the broader industry.

Industrial-Scale Promotion: Establish AI empowerment mechanisms for SMEs through pilot verifications and policy guidance, lowering the barriers to smart manufacturing transformation. This will support the city-wide coordinated development of digital and intelligent manufacturing, and promote improvements in the overall technological level and operational efficiency of the industrial value chain.

The innovation ecosystem refers to a collaborative, open, and shared network of resources built on strategic platforms such as the Chengdu-Chongqing Twin-Hub Mega-Region and the New International Land-Sea Trade Corridor. This ecosystem effectively connects various stakeholders, including government organizations, leading enterprises, research institutions, AI startups, and industry associations, fostering a synergistic environment for innovation.

Within this ecosystem, it is recommended that the Chongqing Municipal People's Government partner with Siemens and other internationally leading technology companies to explore the establishment of a "Chongqing AI + Intelligent Manufacturing Joint Innovation Center." Computational and network infrastructure will be constructed by the government as the foundational resource based while the Siemens Xcelerator platform leverages its powerful integration capabilities to precisely align with the intelligent transformation needs of local manufacturing enterprises. This mechanism is intended to facilitate the efficient integration of key innovation drivers, including technology, application scenarios, capital, and talent, and thereby accelerate the deep application and industrialization of AI technologies within Chongqing's manufacturing sector.

Specifically, we propose that:

Establish an AI + Intelligent Manufacturing Application Promotion Platform: This platform would showcase the outcomes of flagship projects and host activities such as technology roadshows, enterprise matchmaking events, and the listing of AI applications. The goal is to accelerate the dissemination and commercialization of advanced technologies and proven use cases, thereby speeding up the adoption and promotion of intelligent manufacturing applications across the region.

Launch a Dedicated SME Empowerment Program: Implement a set of supportive policy tools, such as financial subsidies, tax incentives, and computing power vouchers, to effectively reduce the cost burden of AI adoption for SMEs. Leveraging the ecosystem resources of the Siemens Xcelerator platform, the program would also provide SMEs with access to technical support, market expansion services, and brand development assistance, helping to strengthen their capabilities in intelligent manufacturing.

Build a Talent Development and Exchange Platform: Encourage universities and enterprises in Chongqing to jointly establish industry-university-research training bases. These bases would focus on cultivating high-level interdisciplinary talent equipped with both algorithmic expertise and a strong understanding of industrial application

scenarios, fostering deep integration between talent development and industrial demand.

As a major manufacturing hub and an important advanced manufacturing center in China, Chongqing stands at a critical juncture in its transition toward the digital economy and industrial intelligence. We firmly believe that by establishing the Chongqing AI + Intelligent Manufacturing Joint Innovation Center, and by fully leveraging the technological strengths and ecosystem resources of leading global enterprises, Chongqing can position itself as a national model and regional powerhouse in smart manufacturing innovation, driving high-quality industrial development and radiating influence across western region and beyond.

Enhancing AI+ in Manufacturing: Expanding Applications to Strengthen Competitiveness

Ernest Nicolas
Chief Enterprise Operations Officer

I. Introduction

Artificial intelligence (AI) is transforming industries at an unprecedented pace—not only by creating new business models and service formats, but also by reshaping the operations of traditional sectors. Manufacturing has emerged as one of the most critical areas for AI adoption. In recent years, the integration of AI and manufacturing has accelerated, delivering substantial benefits across areas such as production process optimization, quality control enhancement, supply chain improvement, and predictive maintenance.

Globally, AI adoption in industrial domains has emerged as a key frontier of technological and economic competition. The United States' recently issued *AI Action Plan* states support for next-generation manufacturing enabled by AI.[1] The German federal government's latest AI strategy, updated in 2020, promotes the technology's adoption in the aerospace sector as a key technology and encourages its expansion in other sectors such as car manufacturing.[2] Other countries have also introduced projects and policies specifically targeting accelerating AI adoption in manufacturing. For example, South Korea launched a series of national initiatives to accelerate AI adoption in manufacturing, including pilot programs to encourage the development of AI-powered autonomous factories.

In China, the "AI Plus" initiative has been included in the *Government Work Report* for two consecutive years, reflecting a strong national commitment to AI integration across economic sectors. A series of policy measures have been introduced at the national level to support AI development—ranging from bolstering computing infrastructure to encouraging corporate participation in the research, development, and application of AI. Specifically, in the manufacturing sector, AI is increasingly positioned as a pivotal driver of "new industrialization."

As a national advanced manufacturing hub, Chongqing has leveraged its extensive industrial application scenarios and robust ecosystem to promote AI applications in manufacturing. The city has actively promoted AI integration, building smart factories and digitalized workshops. By the first half of 2025, the total output value of industries directly and indirectly related to AI in Chongqing surpassed RMB 200 billion (~USD 28 billion).[3] At the

[1] *Source: White House (link)*

[2] *Source: German Federal Government (link)*

[3] *Source: Chongqing Municipal Government (link)*

same time, the city's municipal government has launched policies aimed at driving technological breakthroughs[4] and talent recruitment,[5] providing strong institutional backing for the rollout of AI in industrial applications. Nevertheless, despite Chongqing's rapid progress in integrating AI with industrial practices, there remains room for broader and deeper application of AI in manufacturing.

HP's strategic focus on AI positions it perfectly to support Chongqing in realizing its transformation from "Made in Chongqing" to "Intelligently Made in Chongqing." HP has built a strong partnership with the city in the past decade, with deepening collaboration in AI in recent years. In this paper, we will share three internationally proven models and best practices on promoting AI adoption in the manufacturing sector. We believe that by drawing from these examples, Chongqing could further explore localized strategies for "AI + Manufacturing," seeking strategic breakthroughs through enhanced policy coordination, workforce development, and industry standardization.

II. Key factors enabling AI-powered manufacturing

1. How AI empowers manufacturing

AI has the potential to revolutionize the manufacturing sector by advancing several critical aspects of the manufacturing process, including product design, process optimization, quality control, and production automation. In product design, AI enables generative design and advanced simulation tools, such as 3D modeling and digital twinning, allowing for rapid prototyping and innovative solutions. For production process optimization, AI improves production planning and resource management by leveraging real-time data on demand, inventory, and energy consumption, resulting in more efficient and agile operations. AI-powered quality control systems utilize machine learning, predictive analytics, and computer vision to detect defects in real time. This reduces human error while ensuring strict compliance with industry standards. Additionally, AI dramatically enhances the capabilities of industrial robots, enabling them to work alongside humans on the factory floor. These advanced robots deliver greater precision in production, while freeing human workers from dangerous and repetitive tasks.

Given advancements in AI technology and its ability to transform the way humans live and work, HP has strategically prioritized AI to drive innovation across industries. Our AI-driven product portfolio, including the EliteBook, ZBook, and Z workstations, empowers businesses with enhanced speed, privacy, and cost efficiency.[6] They allow customers to run AI applications locally while ensuring data security, reducing costs, and delivering low-latency performance. Notably, the Z workstations support demanding tasks like AI design and rendering, product lifecycle management, vision and audio inspection and predictive maintenance as well as supply chain

[4] *Source: Chongqing Municipal Government (link)*

[5] *Source: Chongqing Municipal Government (link)*

[6] *Source: Chinanews (link)*

control. Our AI solutions have been adopted across a range of industries, including automotive, manufacturing, education, healthcare, and architecture. Additionally, leveraging our advanced hardware, we have developed AI as a Service (AaaS), supporting companies in identifying relevant AI use cases and collaborating with them to develop vertical AI software solutions. Based on these solutions, we assist clients in training AI models using their private data, ensuring their models are ready for deployment. Throughout this process, HP remains committed to providing clients with a comprehensive suite of professional support tailored to their specific needs.

In the manufacturing sector, HP's Z workstations-based AI solutions prove especially valuable. For instance, they enable manufacturers to leverage digital twinning technology to create virtual production replicas that optimize workflows, reduce material waste, and enhance sustainability.[7] HP has also developed AI-powered tools like the Z Series AI visual detection solutions to improve industrial quality assurance.[8] These systems use real-time AI algorithms to detect surface defects, reduce iteration cycles, and increase operational efficiency. In China, externally, we are already working with our local partners to deliver some of these AI-powered smart manufacturing solutions. Internally, HP is also deploying AI detection solutions in our ODM's production processes in China, enhancing quality control for components like speakers and keyboards in our AI PCs. These AI solutions have set a new standard in the PC industry. Through this innovative approach, we aim to establish a transformative quality control system that leverages data analytics to predict and manage defect rates more effectively.

2. Success factors of realizing AI-powered manufacturing

Chongqing is a testing ground for the integration of AI with the real economy. The city possesses a diverse manufacturing base spanning all of the 31 industrial manufacturing categories listed in China's *Industrial Classification for National Economic Activities*,[9] showcasing exemplary cases of AI adoption in sectors such as intelligent connected vehicles (ICVs) and smart manufacturing.[10] The city also offers numerous other advantages for developing an AI-driven manufacturing industry. As a regional hub in China's "East Data, West Compute" project, Chongqing stands out with its strong computing power. The city's comprehensive industrial systems generate large amounts of industrial data—a critical asset for advancing industrial AI. In addition, the local government places a strong emphasis on AI integration with manufacturing, introducing policies such as the *Several Measures for Supporting the Innovative Development of Intelligent Robotics Industry* and the *Action Plan for the Application of "Robotics+" in Chongqing Municipality (2024-2027)*. In line with its broad policy support, the Chongqing municipal government is also seeking to establish pilot zones to incorporate AI into key manufacturing sectors in collaboration with private enterprises.

However, while Chongqing is undoubtedly a regional leader in intelligent manufacturing, on a national scale,

[7] *Source: HP (link)*

[8] *Source: Liangziwei (link)*

[9] *Source: National Bureau of Statistics (link)*

[10] *Source: Chongqing Daily (link)*

further opportunities remain for Chongqing to accelerate the integration of AI with manufacturing. Given Chongqing's strengths in smart manufacturing, we are confident that, with the combined efforts of government, industry, and research institutions, the city can set a benchmark for intelligent transformation in the manufacturing sector nationally and even globally.

In this paper, we examined three global case studies to identify effective practices for advancing AI-driven manufacturing, covering both overarching AI strategies and their specific applications in industrial sectors. While Chongqing holds distinctive advantages in intelligent manufacturing, it is worth drawing inspiration from these leading international practices. Through the following case studies, we believe that, for the government to strengthen Chongqing's leadership in AI-driven manufacturing, it is essential to provide businesses with targeted support, enhance talent training and upskilling of workforce, and accelerate industry standardization.

III. International best practices for intelligent transformation of the manufacturing industry

1. Germany:

Germany is well-renowned for its strong track record in industrial innovation. As a global leader in advanced manufacturing and pioneer of the "Industry 4.0" concept, the country offers valuable insights into how advanced technology such as IoT and AI can be successfully adopted by the manufacturing industry.

Channeling government support through Mittelstand-Digital Innovation Hubs

Germany's "Industry 4.0" strategy is in large part enabled by the government's robust support for digital transformation, particularly for small and medium-sized enterprises (SMEs). The Mittelstand-Digital Innovation Hubs, established to facilitate the digitalization of SMEs, form a nationwide network that assists SMEs in navigating the opportunities and challenges of digital transformation and AI integration. These hubs provide a range of services including expert knowledge, hands-on workshops, training sessions, and access to demonstration centers where practical applications of AI can be explored. Regular networking events and information sessions facilitate dialogue and best practice sharing, while AI instructors stationed at these hubs offer tailored support to enterprises at all stages of AI adoption—from beginners to experienced users.[11]

Emphasizing lifelong learning in the National Skills Strategy

In its National Skills Strategy, the German government goes beyond formal education to foster lifelong learning, reskilling, upskilling for employees at every stage of their careers. Since Germany's AI 2.0 Strategy was released in 2020,[12] the National Skills Strategy has placed a strong emphasis on enhancing AI-specific skills and

[11] *Source: German Federal Ministry for Economic Affairs and Energy (link)*

[12] *Source: German Federal Government (link)*

supporting AI applications. This strategy calls for wide-ranging measures, including establishing centers of excellence that support inter-company training and enabling SME employees from across the country to benefit from high-level, specialized education and skills development. The government also actively promotes awareness of continuing education and training (CET) opportunities by providing comprehensive information and developing interactive learning platforms. Furthermore, it adopts publicly subsidized educational leave and part-time educational leave policies, allowing employees to pursue further learning without sacrificing job security.

Providing a roadmap for AI standardization

Recognizing the importance of interoperability and collaboration for AI-driven manufacturing, Germany has made standardization one of the key priorities of its AI strategy, developing a roadmap for AI standardization.[13] This roadmap provides a comprehensive overview of the status quo, requirements, and challenges for standardization in areas including industrial automation and formulates recommendations for action. In particular, the standardization roadmap recognizes the importance of integrating mutual impulses from research, industry, society and regulation to shape standards and specifications. It also recommends that developed standards should be tested and further developed based on specific cases.

2. South Korea:

South Korea boasts the highest manufacturing robot density in the world.[14] Its consistent government commitment and ambitious master plans make it a good example of how targeted strategies can foster innovation and high adoption of AI and robotics in manufacturing.

Supporting businesses through consulting services

The South Korean government issued its first *Master Plan for Intelligent Robots* in 2009 and has since released four iterations of the plan.[15] These plans reflect the government's active role in shaping the robotics industry by providing strong support and strategic guidance. For instance, the 4th *Master Plan* (2024-2028) includes a section on supporting startups and new business models, describing a "Boom-Up Program" for advanced robotics startups through tailored consulting services.[16] This consulting covers areas such as specifications, standards, regulatory improvements, product improvement, and integration with regulatory sandboxes. The program is managed and supported by government agencies, with expert committees evaluating and selecting companies for support. The plan also repeatedly emphasizes demonstration projects as key support mechanisms.

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[13] *Source: German Federal Ministry for Economic Affairs and Energy (link)*

[14] *Source: Invest Korea (link)*

[15] *Source: Invest Korea (link)*

[16] *Source: KDI Economic Education and Information Center (link)*

Cultivating a highly skilled workforce for AI ambitions

The South Korean government places significant emphasis on cultivating a highly skilled workforce to support its robotics and AI ambitions, particularly in the manufacturing sector. Seoul currently aims to nurture over 15,000 skilled robotics professionals by introducing specialized robotics convergence courses.[17] Meanwhile, government industries, universities, research institutes, and industry partners are collaboratively developing a wide range of education and training programs, covering AI, software, and robotics. Other projects include dedicated graduate schools, industry-academia cooperation initiatives, and new certification systems to ensure workforce readiness.

Building alliances to facilitate standardization process

The country actively involves a wide range of stakeholders in its standardization process for robotics development. The 4th *Master Plan* calls for the formation of an advanced robotics alliance, bringing together robotics companies, public research institutes, and universities to jointly develop and modularize key components and software. This alliance is tasked with deriving standard specifications for core processes and components, which are then used to reduce costs and improve maintainability for system integrators. The government also regularly convenes the Advanced Robotics TECH Forum—a gathering of over 30 technical experts from public research institutions, supply-side and demand-side companies, and universities—to review industry needs and update technological strategies, including standardization and platform strategies.

3. Singapore:

Singapore's initiatives for AI development and advanced manufacturing, such as the National AI Strategy 2.0 (NAIS 2.0), released in 2023, and National Robotics Programme, updated in 2024, reflect a forward-looking, coordinated national commitment to increasing the city-state's economic and industrial competitiveness with AI.

Facilitating AI development through government initiatives

Singapore's sectoral AI Centre of Excellence for Manufacturing (AIMfg) is a practical manifestation of commitment to empowering manufacturing with AI, outlined in NAIS 2.0. Established by the Agency for Science, Technology and Research (A*STAR), AIMfg brings together industry leaders, researchers, and technology providers to co-develop AI solutions for manufacturing challenges, such as predictive maintenance and supply chain optimization.

RoboNexus, an initiative under the National Robotics Programme, provides Singapore-based startups with tailored mentorship, business development support, and opportunities for global market access. These efforts enable emerging companies to scale quickly and integrate into international supply chains while facilitating the

[17] *Source: KoreaTechToday (link)*

adoption of AI technologies across diverse industrial sectors.

Upgrading the workforce through SkillsFuture Initiative and AI Apprenticeship Programme

In the past decade, the Singaporean government has implemented the SkillsFuture Initiative to subsidize access to thousands of courses and job transition support for citizens over the age of 25.[18] A wide variety of courses related to artificial intelligence are available under this initiative. Today, Singapore's workforce is considered the world's fastest in adopting AI skills.[19]

Similarly, Singapore's AI Apprenticeship Programme (AIAP) serves as a strong model for training the AI talent needed by various industries, including manufacturing. Launched in 2018 and as part of NAIS 1.0, AIAP is designed to provide apprentices with real-world experience through real AI projects, often in collaboration with industry partners. This ensures that participants gain both theoretical knowledge and practical skills in building and deploying AI solutions. AIAP apprentices also help companies develop their first AI products and solutions, bridging the gap between academic learning and industry needs.

IV. Policy recommendations for enhancing AI+ in manufacturing in Chongqing

The Chongqing government already provides strong support to local businesses to facilitate their digital transformation. Notably, the *Several Policies on Supporting Enterprises' Digital Transformation*, released in January 2025, pledges support such as funding for companies that invest in smart factories and exemplary enterprises recognized in the nationwide digital transformation pilot program. The Chongqing government also promotes the sharing of best practices and exchanges between companies by organizing tours, arranging forums, and publishing successful examples of digital transformation by SMEs.[20] In the areas of talent and workforce development, local vocational training centers provide a variety of courses to improve local professionals' opportunities for employment, with course information accessible on government websites.[21]

Building on the municipal government's existing support for digital and intelligent transformation, and drawing inspiration from the international practices outlined above, we propose several additional measures aimed at further strengthening Chongqing's competitiveness in AI-driven manufacturing.

1. Provide enhanced guidance and support to businesses on intelligent transformation

Firstly, we recommend that the Chongqing government consider establishing a robust, multi-layered support ecosystem dedicated to accelerating AI-powered manufacturing. Establishing an AI+ manufacturing advisory cen-

[18] *Source: Center for Strategic & International Studies (link)*

[19] *Source: CNBC (link)*

[20] *Source: Chongqing Municipal Government (link)*

[21] *Source: Chongqing Municipal Government's Department of Human Resources and Social Security (link)*

ter would provide businesses with the support and guidance needed to integrate AI into manufacturing.

This AI+ manufacturing advisory center could offer a comprehensive suite of consulting services to local companies on their intelligent transformation, including advice on technical specifications and standards. The center would also organize workshops, training sessions, and networking events. These exchanges could help foster a collaborative environment among businesses. The government could also employ AI instructors or advisors at the center responding to businesses' inquiries about AI transformation.

The center may also feature demonstration projects that showcase AI applications in manufacturing, shedding light on practical pathways for AI adoption in industrial settings. These cases will not only accelerate the adoption of AI technologies, but also build confidence among traditional manufacturers in investing in AI-driven transformation. HP stands ready to contribute to this initiative by providing examples of our intelligent manufacturing solutions, highlighting how AI is applied in predictive maintenance, quality control, product design, and production safety. For example, through our HP AI Visual Inspection All-In-One (AIO) enabled by our Z workstations, HP is already helping manufacturers to enhance onsite production safety by effectively controlling workplace hazards in complex environments and strengthening protocols through data-driven assessments across departments.

Additionally, the AI+ manufacturing advisory center could gather feedback from manufacturing companies in Chongqing to gain insights into the challenges they face during their intelligent transformation. Drawing on this feedback, the center could convene industry leaders, researchers, and technology providers to identify priority areas for AI solutions and collaborate on co-developing these solutions.

2. Enhance talent attraction, upskilling and reskilling of the workforce

As talent is the driving force behind AI-powered manufacturing, it is essential that Chongqing cultivates a workforce equipped to lead the city's intelligent transformation. To achieve this, the city is advised to adopt a multi-pronged approach: 1) actively attract global talent, 2) ensure that local educational programs are closely aligned with the evolving demands of AI-driven manufacturing, and 3) launch AI training initiatives as part of continuing education for the existing manufacturing workforce.

In the current global race for AI leadership, leading economies are making concerted efforts to attract and retain talent in AI manufacturing. To keep pace, Chongqing is recommended to further increase its attractiveness for international talent to work and live in, including providing strong R&D infrastructure, robust funding opportunities, and streamlining the process for international talent to relocate and settle in Chongqing. China's recent revision of the *Regulations on the Administration of the Entry and Exit of Foreigners* focuses on attracting young foreign professionals in science and technology to China by introducing a new visa category, the "K" visa. This new visa category could bolster Chongqing's own talent initiatives, helping the city attract more international talent with strong backgrounds in R&D to the city. These measures will help the city draw in world-class researchers, engineers, and entrepreneurs, enriching the local innovation ecosystem and accelerating the adoption of advanced

manufacturing technologies.

Equally important is the alignment of educational curricula with industry needs. Chongqing may encourage close collaboration between innovative enterprises, universities, and vocational training centers to co-design courses that equip students with the practical skills and interdisciplinary knowledge required for AI manufacturing—from software development and data analytics to process optimization and robotics integration. HP has long supported the enhancement of digital education through collaboration with partners in China, and we welcome the opportunity to share our experiences to support similar efforts from the Chongqing government.

Furthermore, as demonstrated by Germany and Singapore, successful transformation also requires upskilling and reskilling the existing workforce. It is commendable that the Chongqing municipal government's Human Resources and Social Security Department already provides valuable training support and disseminates information on relevant courses and training policies, including subsidy programs, on its official website. However, the range of available courses could be further expanded to better encompass the diverse skill set demanded by smart manufacturing, such as programming, advanced automation, and cybersecurity. The government may also encourage lifelong learning. Policies and support should be extended not only to workers facing employment challenges,[22] but also to those seeking career advancement by acquiring new and more advanced skills. Subsidized educational leave and part-time educational leave policies may be explored to encourage participation in these training programs.

3. Accelerate standardization process to promote AI adoption along supply chains

Standardization plays a crucial role in accelerating the adoption of AI in manufacturing by establishing unified frameworks that facilitate seamless cooperation across supply chains. We recommend that the Chongqing government increase its support for local standardization efforts for AI-powered manufacturing by emphasizing the incorporation of specific use cases into standardization processes and ensuring broad participation from research institutions, industry, and the government.

The standardization needs for industrial AI applications are best identified through the analysis of typical application scenarios and industry-specific use cases. These real-world examples provide concrete insights into the requirements for safety, interoperability, reliability, and scalability—key factors for successful AI deployment in manufacturing. Therefore, we recommend that Chongqing's local standardization efforts systematically incorporate specific use cases into their processes. In particular, when a company achieves a breakthrough in manufacturing innovation, whether in quality control, product design, or other areas, the government should recognize and reward these contributions, enabling companies to actively participate in the standard-setting process. This will not only ensure that standards remain relevant and forward-looking but also incentivize ongoing innovation and industry engagement.

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[22] *Source: Chongqing Municipal Government's Department of Human Resources and Social Security (link)*

Meanwhile, foreign companies often bring advanced technologies and industry insights from around the world to China and are often global leaders in innovation. By involving multinational enterprises in the development of local standards, local industry can benefit from new ideas while aligning with international norms and improving overall industry quality. We look forward to the Chongqing government introducing favorable policies that enable foreign companies to actively participate in the local standard-setting process for a range of industries, particularly intelligent manufacturing. HP stands ready to contribute our institutional knowledge and expertise and provide ongoing support for the establishment and optimization of these standards.

Finally, broad participation in the standardization process is essential for developing robust, widely accepted standards that genuinely reflect the needs and realities of the entire manufacturing ecosystem. When research institutes, universities, government bodies, large corporations, and SMEs are all involved, the resulting standards are more likely to be technologically advanced, relevant to actual industry practices, and applicable and interoperable across diverse manufacturing contexts.

To achieve this synergy in standards formulation, the Chongqing government is recommended to establish multi-stakeholder committees or working groups as part of the standardization process. These committees or working groups should comprise experts from public research institutions, supply-side and demand-side companies, and universities to review industry needs and develop a standardization roadmap for AI-empowered manufacturing. Incentives such as recognition, funding, or expedited regulatory pathways may be provided to encourage participation from innovative companies and academia. This collaborative, transparent approach will strengthen industry trust, accelerate adoption, and enhance Chongqing’s competitiveness in intelligent manufacturing.

V. Conclusions

Amid domestic and international competition to leverage AI for manufacturing upgrades, Chongqing, as one of China’s leading regional manufacturing hubs, is accelerating its own efforts to promote applications of AI on the factory floor. The Chongqing government already provides exceptional support for the intelligent transformation of the manufacturing sector in various areas, as evidenced by the city’s leadership in advanced manufacturing in Western China. After examining the development of AI and manufacturing in three advanced economies, we recommend Chongqing’s government enhance support in three key areas: supporting and guiding businesses, particularly SMEs and startups; advancing talent training and workforce upskilling; and prioritizing standardization efforts.

We believe that strengthening efforts in the above areas will further advance Chongqing’s industrial excellence in the era of AI, and we look forward to participating in the city’s future development and supporting its efforts to foster innovation in manufacturing.

Building an AI Application Hub to Enable High-Quality Industrial Development

Saw Choon Seong
Global Vice President & China President

With the rapid advancement of artificial intelligence (AI) technologies, global manufacturing is undergoing a profound digital and intelligent transformation. In August 2025, China issued the "Opinions on Deepening the Implementation of the AI+ Initiative," setting clear short-, medium-, and long-term goals for 2027, 2030, and 2035. As a key national center for advanced manufacturing, Chongqing is actively responding to national strategic directives, leveraging "AI + Industry" as a core driver to deeply integrate digital technologies with the real economy, and striving to build a new high ground for intelligent manufacturing. Chongqing has launched the "AI +" Action Plan, cultivating 43 exemplary AI application cases and deploying 28 key scenario requirements, covering pillar industries such as automotive, electronics, and equipment manufacturing, injecting new momentum into high-quality industrial development.

Under this background, industrial gases—critical foundational materials supporting advanced manufacturing sectors such as electronics, new energy, and high-end equipment—are playing an increasingly important role. The innovative gas application technologies and solutions, as well as the industry's own exploration of intelligent upgrades, will be key drivers for Chongqing in building a new "AI + Advanced Manufacturing" ecosystem and modern industrial system.

Air Products is a world-leading industrial gas supplier. As one of the first multinational industrial gas companies to invest in China's mainland, it has served China for nearly 40 Years and has been rooted in Chongqing for over 20 years. As both a witness to and participant in Chongqing's development, Air Products is honored to leverage its global industry experience, long-term partnerships, and integrated solutions to continuously support Chongqing's exploration and practice in integrating AI with industrial development.

This report draws on Air Products' global experience—including over 40 years serving the electronics manufacturing sector—and its digital transformation practices in China to illustrate how these strengths support AI-related industries. It shares the pathways for applying AI technologies in industrial gas innovation, production, service, and management, providing recommendations and references for the transformation and upgrading of traditional industries in Chongqing.

I. Building a "Gas Island" Model to Accelerate Scale Effects and Industrial Clustering in Next-Generation Electronics Manufacturing

1. The Core Role of Industrial Gases in Electronics Manufacturing

Chongqing's next-generation electronic information manufacturing industry boasts massive scale, high enterprise concentration, strong innovation capabilities, comprehensive industrial support, and extensive openness and regional collaboration. It occupies a central position within the "33618" modern manufacturing cluster system. As one of the three trillion-yuan leading industrial clusters, Chongqing is driving the industry toward higher-end, smarter, and greener development, aiming to build globally competitive industrial clusters.

Industrial gases are essential in electronic information manufacturing, spanning key processes such as wafer etching, deposition, and cleaning. The purity, stability, and supply efficiency of gases directly affect semiconductor yield and performance. The development of next-generation electronics and information manufacturing and the formation of industrial clusters are critical foundations for building Chongqing's "AI + Advanced Manufacturing" system. With the rapid iteration of emerging technologies such as AI, high-performance computing, and autonomous driving, the electronics manufacturing industry's reliance on industrial gases continues to grow.

Air Products, as a global leader in high-purity industrial gases for electronics manufacturing, has extensive experience providing integrated solutions to the electronics sector. Its technical standards and supply capabilities are at the forefront of the industry, and through patented technologies, intelligent gas supply systems, and a global supply chain network, the company is deeply involved in building Chongqing's electronics manufacturing clusters.

2. The "Gas Island" Model as an Innovative Practice for Cluster-Based Gas Supply

The "Gas Island" model proposed by Air Products involves building integrated gas supply within electronics industrial parks to supply safe, efficient, and cost-effective gases to customers in the parks. For example, Air Products' gas pipeline networks have successfully supported the rapid development of electronics industries in high-tech parks in Silicon Valley (USA), Pyeongtaek (Korea), and Kulim (Malaysia). In the Gulf region of the U. S., the company operates the world's longest hydrogen pipeline (1,100+ kilometers). We have also brought our global success experience to China. In Nanjing (where a 70+ kilometer pipeline operates at the Nanjing Jiangbei New Materials Science Park), Xi'an, Guangzhou, etc., the company's gas supply network has also contributed to the high-quality growth of the local electronics industry. This gas supply model has received high recognition from local governments and industrial parks in cities like Xi'an and Nanjing. The "Gas Island" model significantly enhances gas supply safety, stability, and reliability through a mutually backup-enabled integrated supply network, while simultaneously optimizing industrial chain supporting capabilities and economic benefits. The integrated gas supply solution covers full-chain services from planning and construction to operation, helping electronics parks achieve environmentally friendly operations and cost effectiveness, while reliably supporting high-end manufac-

turing demands. This model not only meets the diverse gas needs of electronics manufacturing but also enhances the attraction for leading enterprises through integrated supply, accelerating industrial clusters development and driving regional industrial upgrading.

In Chongqing, Air Products is focusing on key parks like the Chongqing Xiyong Microelectronics Industrial Park, to replicate the "Gas Island" model, centrally deploying gas production, storage, and transportation facilities to serve local leading semiconductor manufacturers. This model will be extended to other electronics parks, enabling comprehensive support for the quality and upgrading of Chongqing's next-generation electronics and information manufacturing industry.

3. Synergistic Effects of Industrial Clusters

Through the "Gas Island" model, Chongqing can attract upstream and downstream enterprises, forming a complete industrial chain from gas supply to electronics manufacturing to end applications. Surrounding the gas island, supporting enterprises such as equipment manufacturers and gas detection service providers can be established, further reducing logistics and operational costs and enhancing regional competitiveness.

In summary, the Chongqing municipal government's implementation of the "Gas Island" integrated gas supply model in electronics industrial parks is not only a key initiative to enhance the modernization level of park infrastructure, but also a core support for driving the agglomeration and high-end development of the electronics and information industry.

By building an efficient, safe, and low-carbon industrial gas supply system, parks can significantly improve operational cost-effectiveness and resource allocation efficiency, providing reliable gas supply for key areas such as integrated circuits, new displays, and power semiconductors. This strategy aligns closely with the "33618" modern manufacturing cluster system and the "AI + Advanced Manufacturing" integration pathway, accelerating the formation of a full-chain ecosystem ("chip, display, terminal, core, network") and helping platforms such as Science City High-Tech Zone and Xiyong Microelectronics Park build national integrated circuit industry bases and global power semiconductor hubs.

In the long term, integrated industrial gas supply will strengthen the "hard technology" foundation of Chongqing's electronics industry, enhance upstream and downstream industrial chain synergy, attract global leading companies, and drive local sectors such as automotive electronics and smart equipment to reinforce and extend the entire supply chain.

II. Exploring Innovation in Traditional Industries and Advancing Intelligent Operations for Smart Manufacturing Transition

The integration of industrial gases—a traditional industry—with AI technologies is reflected not only in

improved production efficiency and safety, but also in the digital empowerment of the entire value chain. For example, AI-driven intelligent production systems can monitor parameters such as temperature and pressure in real time, dynamically optimize air separation unit efficiency, and reduce energy consumption; predictive maintenance technologies can identify equipment failure risks in advance, minimizing unplanned downtime; intelligent supply chain management uses demand forecasting and logistics algorithms to achieve precise and low-carbon gas delivery. AI is evolving from a "tool" to a "core productivity driver" for industry transformation.

1. Building a Gas Application Technology Smart Platform to Help Customers Achieve Smart Manufacturing

Air Products not only utilizes digital and AI technologies in its own air separation plants and on-site gas production facilities but also provides customers with digitalized gas application solutions to help them achieve smart manufacturing.

The company's gas application technology smart platform, called Air Products Smart Technology offers different levels of digital services tailored to customers' needs: Tier 1 Smart gas application equipment equipped with precision sensors helps customers store and access key gas-related process parameters via cloud storage and online retrieval. Tier 2 Customized IoT process visualization interfaces enable customers to monitor process parameters in real time via personal computers or mobile devices, with alerts for abnormal conditions. The system integrates gas data with customer process parameters, generates customized reports, and provides operational recommendations. Tier 3 AI big data models and machine learning technologies for the future are being developed to help customers achieve automatic optimization of production processes and predictive equipment maintenance planning.

For example, by integrating advanced technologies such as AI and machine learning, the upgraded Remote Operations Support Center enhances the online rate, efficiency, and quality control management of semiconductor bulk gas plants, enabling high safety, reliability, efficiency, and quality control for semiconductor bulk gas plants and small unmanned factories, thereby supporting the rapid development of the electronics industry.

Since its launch, Air Products' gas application smart technology platform has successfully served customers in various fields, including electronics, advanced materials, food freezing, water treatment, glass, and non-ferrous metals. The following are two typical cases: NitroFAS® iFAMS Smart Furnace Atmosphere Monitoring System: Helps electronics packaging customers digitally centralize the management of dozens of reflow furnace atmospheres across different plant areas, maximizing nitrogen savings, improving product yield, and enabling data traceability. Customized IoT Visualization Interface (AP SmartView): Helps food freezing customers monitor freezer operational status, liquid nitrogen usage, tank liquid levels, and other critical data in real time, with timely alerts for production anomalies.

Through advanced digital technologies, Air Products helps customers achieve smart manufacturing, ensure production safety, improve production efficiency and product yield, reduce downtime, lower production costs, and

enable traceability of production data. In China, the company has deployed SMART technology system for key electronic clients to better manage and enhance the intelligence and efficiency of gas supply. In Chongqing, we have also implemented this system to monitor gas usage efficiency in customers' process steps in real time, optimizing semiconductor manufacturing processes. Simultaneously, the company is also focusing on the intelligent upgrade of the new energy vehicle industry and looks forward to providing smart gas solutions for local automakers.

2. "AI + IoT" Driven Smart Logistics: Enhancing Delivery Efficiency and Safety

Air Products leverages IoT and intelligent algorithms to build an efficient and safe gas logistics system: Intelligent Dispatch System: AI dynamically plans optimal routes based on historical data and real-time demand forecasts, optimizing delivery routes and frequency, and the efficiency of single transportation has been significantly enhanced; intelligent safety monitoring, by installing sensors on transportation vehicles to collect real-time data on vehicle and driver behavior, improves the efficiency of safe transportation; intelligent customer service achieves an ultra-high order fulfillment rate and enables proactive customer service.

To address Chongqing's mountainous terrain and complex geography, Air Products has developed AI-based multimodal transport solutions (road + pipeline), enhancing gas delivery efficiency and setting a new benchmark for safe, efficient, and intelligent industrial gas logistics in Chongqing's advanced manufacturing sector.

Conclusion and Outlook

Chongqing's "AI + Advanced Manufacturing" strategy presents unprecedented opportunities for the industrial gas industry. Through the "Gas Island" model and digital transformation toward the "Future Factory", Air Products not only provides essential support for Chongqing's manufacturing sector but also drives the local industrial chain toward higher-end, smarter, and greener development.

It is suggested that the Chongqing municipal government further promote the replication and expansion of integrated industrial gas supply model across more parks, improve relevant policy support, and foster collaborative innovation in the industrial chain.

Looking ahead, Air Products is committed to deepening cooperation with the Chongqing government and industry partners, jointly exploring innovative pathways for "gas technology + AI", and helping Chongqing achieve more sustainable and high-quality development in the "14th Five-Year Plan" ,"15th Five-Year Plan", and beyond.

Building Chongqing's New Intelligent Manufacturing Ecosystem: AI-Driven Development Strategy

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AI is reshaping global manufacturing, from smart control systems in data centers to real-time edge processing on factory floors. As AI technology matures, applications like cloud-edge collaboration, process control, yield optimization, and predictive maintenance are solving manufacturing's biggest digital transformation challenges.

Chongqing's complete automotive supply chain and strong industrial base create ideal conditions for smart manufacturing. The city can leverage AI to build economically viable intelligent systems that connect the entire value chain—from data collection and analysis to actionable insights and continuous improvement—transforming Chongqing from a manufacturing hub into a smart manufacturing leader.

I. Chongqing's Manufacturing Foundation and Opportunities

China's AI leaders have found their niches: Beijing and Hangzhou focus on algorithms, Shenzhen on hardware, Shanghai on financial applications. Chongqing, as a major manufacturing center covering 39 of China's 41 industrial sectors, has the foundation for its own differentiated AI development.

As a national automotive powerhouse, Chongqing produced 2.5 million vehicles in 2024, including 950,000 electric vehicles (expected to reach 1.3 million in 2025). The city's electronics industry generates over $100 billion annually, spanning semiconductors, displays, devices, and networking. With 6 million registered vehicles, Chongqing's automotive aftermarket is worth $12 billion, creating massive opportunities for smart maintenance and predictive services.

Through its "33618" manufacturing cluster system, Chongqing has strengthened key industries including electric vehicles and electronics. The city offers unique manufacturing scenarios and infrastructure that other regions can't replicate. Rather than competing in the computing arms race, Chongqing can win through application innovation, converting its industrial expertise into AI-era advantages.

II. Breaking Through Manufacturing Intelligence Barriers

Manufacturing intelligence has struggled to scale because cost-effective solutions linking digital and physical systems didn't exist. Traditional centralized AI is expensive and slow, failing to meet manufacturing's real-time requirements. These systems can't handle complex factory environments, instant decisions, or data security needs.

Technology evolution has created practical solutions. Modern smart manufacturing needs both centralized and distributed intelligence working together—central AI handles complex decisions, model training, and global optimization, while edge systems manage real-time sensing, rapid response, and local control. This "cloud-edge collaboration" gives every sensor, machine, and node appropriate processing power, creating layered intelligence.

Recent breakthroughs make this architecture viable. AI large language models like GPT-4, Claude, and Gemini reach trillion-parameter scales, while China's DeepSeek achieves similar performance for under $6 million in training costs, proving AI doesn't require massive investment. Central computing has grown from petaflops in 2020 to exascale today, enabling complex reasoning and optimization. Edge computing has also leaped forward—following Moore's Law, mature sensors, low-power wireless, and optimized algorithms now enable complex AI on tiny devices. Today's fingernail-sized edge chips outperform 1990s supercomputers while using just milliwatts. This combination of powerful central computing and efficient edge processing, plus China's cost advantages in AI, creates the foundation for large-scale deployment.

III. Proven Results from Leading Manufacturers

Global manufacturing leaders have validated AI's value through real-world implementations. STMicroelectronics, for example, has systematically integrated machine learning, computer vision, robotics, and natural language processing into the entire manufacturing process, forming a comprehensive smart manufacturing application system.

Process Control & Quality: Notably, significant breakthroughs have been made in AI-driven defect detection systems.ST has deployed more than 400 AI models for Automatic Defect Classification, creating a complete intelligent system from defect detection to corrective decision-making. Through continuous algorithm optimization and agile updates, the AI model deployment cycle has been dramatically shortened from 42 days to just 7 days, greatly improving the production line's responsiveness. More importantly, the detection accuracy has seen a qualitative leap. In the latest production applications, AI are now handling nearly 100% of X-ray inspection tasks, truly achieving the dual goals of "zero quality escapes and zero manual intervention". At the same time, driven by real-time AI monitoring and smart decision-making, product defect rates have been significantly deduced while production efficiency has been apparently improved. Equipment Productivity: ST is advancing comprehensive AI transformation through automated systems based on real-time sensor data and exploring humanoid robots in production. Notably, ST has developed an AI-powered maintenance assistants using natural language processing,

making equipment maintenance smarter and more efficient. As a result, Overall Equipment Effectiveness (OEE) has improved.

Factory Optimization: ST has successfully implemented AI-driven scheduling systems, smart spare parts forecasting, product tracking, and material risk modeling. Although the return on investment (ROI) for these individual projects is relatively modest,, together they have laid a solid foundation in both data and operations for more advanced AI systems. These practices show that successful smart manufacturing requires differentiated technology combinations tailored to different scenarios, and the construction of a complete technology system spanning from cloud to edge, and from software to hardware. ST's experience demonstrates that enterprises need to find the optimal balance between effort and return on investment, prioritize the deployment of high-value applications, and gradually build comprehensive smart manufacturing capabilities. This provides a practical reference path for companies in Chongqing—starting from high-value use cases and expanding progressively to drive smart transformation systematically.

IV. Smart Manufacturing's Technical Path and Economic Value

Global manufacturers prove that cloud-edge collaborative architectures using multiple AI technologies work. This approach offers three core advantages:

Multi-level Processing: Central AI handles complex training, big data analysis, and global optimization, while distributed systems manage real-time processing and instant decisions at data sources. This delivers millisecond response times crucial for precise robot control, emergency braking, and real-time quality checks, while dramatically reducing data transmission and central processing loads.

Scalable Economics: Distributed intelligence changes cost structures completely. High-end AI servers cost hundreds of thousands of dollars, but smart terminals cost hundreds to thousands, slashing transformation barriers. This enables SMEs to afford upgrades, democratizing smart manufacturing. Estimates show cloud-edge architecture costs just 30-40% of pure centralized solutions.

Mature Ecosystem: China has deep expertise in embedded systems and industrial IoT, with complete value chains from chips to applications. Major AI platforms have huge developer communities with rich resources. Domestic companies now offer competitive industrial AI chips, smart sensors, and edge devices.

This multi-level intelligence enables local processing and real-time decisions while creating bidirectional data flow between manufacturing and services, forming complete value loops. This model drives emerging clusters in smart equipment, intelligent services, and data services—a key path for developing new productive forces.

V. Three-Layer Intelligence System for Value Creation

Comprehensive AI application creates a three-layer manufacturing intelligence system, with each layer solving specific problems and all three working together to build complete ecosystems.

Layer 1: Smart Production—Intelligent Equipment

Production intelligence gives equipment perception, analysis, decision-making, and execution capabilities, transforming mechanical tools into intelligent partners.

Traditional equipment gains intelligence through smart modules integrating sensors and AI processors, enabling health monitoring, fault prediction, and adaptive control. Computer vision and machine learning provide real-time monitoring and optimization, significantly improving efficiency.

Humanoid and collaborative robots represent the future. AI-powered embodied intelligence understands instructions, perceives environments through vision and touch, plans autonomous actions, and collaborates naturally with humans in complex assembly and flexible production.

Distributed architecture gives every workshop, line, and machine appropriate intelligence for independent decisions and collaborative work. When equipment detects problems, it immediately adjusts while coordinating with upstream and downstream systems, creating stronger factory adaptability.

Layer 2: Smart Products—Intelligent Features

Product intelligence gives products environmental awareness, need understanding, and autonomous decision-making, transforming passive tools into intelligent assistants.

Smart vehicles exemplify this transformation, using multiple processors and AI to achieve environmental perception and intelligent decisions through sensor fusion. Distributed processing provides real-time perception, local intelligence, and continuous evolution.

Smart products become service platforms, not just functional tools. Electric vehicles become energy management, health monitoring, and entertainment platforms, creating continuous value through software and services for personalized, intelligent experiences.

In the Industrial Internet of Things, every smart product is a network node that works independently and collaborates with others. Local processing enables edge coordination, improving speed and reliability.

Layer 3: Smart Services—Continuous Value Creation

Service intelligence uses AI to shift from “selling products” to “selling services” and from “reactive maintenance” to “predictive maintenance.”

Predictive maintenance continuously monitors equipment data and builds failure prediction models. Compared to traditional approaches, it cuts maintenance costs 40%+, reduces unplanned downtime 50%, and extends equipment life 20-30%.

AI enables personalized services by analyzing usage patterns, environmental conditions, and preferences to provide customized configurations and solutions. Smart products learn and adapt to user needs, delivering "mass customization" experiences.

AI enables full lifecycle value optimization. From design and production through use, maintenance, and recycling, each stage contributes data for value creation. AI-driven lifecycle management can increase product value 30%+.

When all three layers work together, traditional linear value chains become circular value loops. Data flows bidirectionally across the entire chain, with each link receiving feedback from others, creating continuous learning and optimization cycles. This transforms business models from selling products to providing services, from product to service economies.

VI. Automotive Industry Pilot Implementation

We recommend Chongqing leverage its automotive strength as the breakthrough point, systematically building AI ecosystems that create complete "manufacturing-service" value loops while advancing intelligent and green development.

Recommendation 1: Build Smart Automotive Aftermarket Ecosystem

Strategic Vision: Redefine aftermarket services through data-driven lifecycle management. Partner with leading automakers, suppliers, service providers, and users to create collaborative intelligent service ecosystems.

Key Initiatives: Build AI-powered "smart manufacturing + smart maintenance" integrated platforms. Use AI for complete production quality tracking; implement proactive maintenance through vehicle health monitoring and fault prediction. Create data platforms spanning design, manufacturing, use, and maintenance to enable effective information flow across the value chain.

Recommendation 2: Create Zero-Carbon Smart Factory Showcase

Strategic Vision: Make Chongqing a demonstration city for automotive "dual carbon + dual intelligence" (carbon neutrality + digitalization/intelligence) integrated development. Use zero-carbon goals to drive smart upgrades and intelligent methods to support green development.

Key Initiatives: Deploy smart sensor networks and AI optimization systems for real-time energy and emis-

sions monitoring and control. Leverage Chongqing's silicon carbide advantages to promote efficient power devices in factory systems.

Recommendation 3: Advance Embodied Intelligence Cluster

Strategic Vision: Starting with automotive manufacturing, seize humanoid robotics and embodied intelligence opportunities to make Chongqing a demonstration hub for embodied intelligence applications.

Key Initiatives: Attract and develop core embodied intelligence companies, creating value chains from components and algorithms to manufacturing and integration. Build testing and verification centers providing standardized environments and certification. Create talent development programs with universities for embodied intelligence professionals.

VII. STMicroelectronics Partnership Commitment

In its exploration of smart manufacturing, STMicroelectronics has gradually developed an innovation system that encompasses technology R&D, practical applications, and ecosystem collaboration. In core technology areas such as microcontrollers, sensors, analog and power devices, STMicroelectronics has built a relatively complete product portfolio and accumulated solid technical expertise. We fully understand that successful smart manufacturing requires not only technological innovation, but also deep integration with local industries to form a collaborative development ecosystem. As a company rooted in Chongqing and committed to its long-term development, STMicroelectronics is glad to leverage the growth opportunity of our silicon carbide joint venture to introduce its experience in AI application and innovation ecosystems to Chongqing, jointly exploring smart manufacturing paths suited to local industry characteristics. We believe that through government guidance, enterprise leadership, and industry-academia-research collaboration, Chongqing is capable of achieving breakthrough in smart manufacturing development, realizing a historic transformation from "Made in Chongqing" to "Smart Made in Chongqing."

AI in France and Enlightenment for Chongqing

Ruling Zhang Blein
Chairman & CEO

"At a time when the United States and China have made mastery of AI one of the pillars of their national strategies, we must rise to the challenge of AI, or risk losing the control of our future. We need to reform our institutions and public policies, so that AI can play its full part in driving progress." These are the words written at the very beginning in the action plan *Our AI: our ambition for France* issued by Artificial Intelligence Commission of the French government in 2024.

Artificial intelligence (AI) is becoming the technological cornerstone of modern national governance, and competition in the AI field has evolved into a struggle for technological sovereignty. Indeed, governments around the world fully recognize that AI is no longer just a technological tool but a core element of a nation's comprehensive strength. Its importance is reflected in multiple dimensions, including economic growth, innovation-driven development, social governance, and international competition. In the era of intelligent civilization, a nation's ability to harness AI will determine its position in the future global order.

In this paper, Sodefinance is going to focus on introducing the strategies and practices taken by the French government and French companies, especially the manufacturing companies, in popularizing and applying artificial intelligence. We wish that these examples could provide Chongqing with some reference and inspiration.

I. Measures taken by the French government

1. Government support: comprehensively promote the integration of AI in French companies

The French Ministry of Economy, Finance, and Industrial and Digital Sovereignty announced a new initiative on July 1st, 2025, aiming to integrate artificial intelligence (AI) into the operations of all businesses by 2030. The plan, titled 'Bravely Embrace AI: A Comprehensive Promotion Plan for AI in All Enterprises', sets ambitious targets for AI adoption: 100% of large enterprises, 80% of small and medium-sized enterprises, and 50% of micro-enterprises. The French government intends to support this initiative through a combination of promotion, training, and assistance to help businesses incorporate AI into their daily operations. This move comes in response to challenges faced by companies regarding AI usage, including concerns about security, timeliness, cost, and return on investment.

2. Investment-driven strategy: huge investments to build the foundation for AI development

On February 6 the French presidency announced that the United Arab Emirates would invest 30 to 50 billion of euros to build a huge artificial intelligence data center in France, which will be the core of a new AI "campus" and will have up to a gigawatt of capacity. It was part of a larger AI agreement signed between French President Emmanuel Macron and his UAE counterpart Sheikh Mohamed bin Zayed al-Nahyan in Paris on that day.

Three days later on Sunday, February 9, President Emmanuel Macron announced on the eve of the opening of the AI Action Summit that more than 109 billion euros would be invested over the next few years for AI infrastructure projects in France.

France's investment in artificial intelligence demonstrates its long-term vision and firm determination to build competitive advantages. It focuses on cultivating AI talents and scientific research ecosystems, striving to establish an AI social environment trusted by citizens. The government also hopes to empower the digital upgrade and automation transformation of traditional industries such as manufacturing, medical care, agriculture, and transportation through AI, thereby improving France's overall productivity, reducing dependence on low-cost labor, and maintaining international competitiveness in high-value-added industries.

II. AI Adoption in the French Enterprises

1. Pragmatic application to improve customer experience and internal efficiency

The French beauty giant L'Oréal announced in this June a collaboration with Nvidia to improve the efficiency of its AI applications: its generative AI content-creation platform and a new AI product-recommendation engine. The generative AI content-creation platform, known as CreAItech, can import three-dimensional renderings of products and then use AI to generate photo-realistic images and videos for marketing purposes. And its product-recommendation engine, known as Noli, offers customers hyper-personalized suggestions based on factors like skin type, hair type, and preferences.

Orange, France's largest telecom operator, reported in this February a fourth-quarter core profit that beat market expectations. Its CFO Laurent Martinez said Orange has been using artificial intelligence for a number of years and is investing 6 billion euros of capex per year.

The company currently has 150 active AI use cases, which generated 200 million euros in value in 2024 and expects to generate more than 300 million euros in 2025 with the help of the technology. In last November, Orange struck a multi-year partnership with OpenAI in Europe, giving the telecom operator access to pre-release AI models.

2. Practice in the manufacturing industry

The manufacturing sector accounts for roughly 10% of France's total GDP, and productivity increases have

been at the forefront of this sector's focus with generative AI. Taking the automobile manufacturing industry as an example, Renault has been using 300 operational applications of AI, and is testing generative AI to help speed up product engineering. Since rolling it out across multiple sites, it has seen boosts in both productivity and quality. Peugeot, another automobile manufacturing giant, isn't limiting its investments to productivity. It has announced it would integrate an AI-based chat function called "Peugeot's I-cockpit" via ChatGPT to help improve voice assistance across its vehicles.

As for Sodefinance's long-term partner MERSEN, a global expert in electrical specialties and graphite-based materials, it's commitment to designing innovative solutions aligns with the transformative potential of AI in optimizing manufacturing processes across sectors such as energy, transportation, electronics, chemical, and process industries. The integration of AI technologies is poised to enhance manufacturing processes, streamline operations, and unlock new dimensions of innovation.

(1)Optimize manufacturing process

By harnessing the power of machine learning algorithms, the group aims to fine-tune manufacturing process, identify optimization opportunities, and minimize resource wastage.

(2)Develop innovative materials

AI's analytical prowess is instrumental in accelerating materials research and development. Mersen's focus on advanced materials can benefit significantly from AI algorithms that predict material properties, optimize formulations, and expedite the discovery of novel materials.

(3)Optimize supply chain

Machine learning algorithms analyze historical data, market trends, and external factors to facilitate data-driven decision-making, enabling Mersen to proactively respond to market demands and fluctuations, thus enhancing overall supply chain efficiency.

III. Enlightenments for Chongqing's Advanced Manufacturing Industry

Chongqing is a major manufacturing hub in China. In recent years, it has vigorously promoted the development of intelligent manufacturing, high-end equipment, automotive electronics and other fields. The measures taken by the French government and its enterprises to promote and apply artificial intelligence may inspire Chongqing Municipal Government in the following ways:

1. Build a systematic AI promotion mechanism, especially for small and medium-sized en-

terprises

Chongqing should actively promote the transformation of local manufacturing enterprises to intelligent ones, encourage enterprises to learn from the successful experience of international advanced enterprises in AI application, and explore suitable paths based on their own business characteristics and needs. Chongqing can formulate a similar popularization action plan, set phased goals, and promote the gradual implementation of AI in large, medium and small enterprises. We think that large enterprises are willing to invest a lot of manpower and material resources to actively meet the challenges of the AI era, while small and medium-sized enterprises generally face the following difficulties:

(1) The bosses blindly pursue models and ignores the adaptability to actual business;

(2) Expecting AI to solve management problems beyond its capabilities;

(3) The cost for hiring compound talents who understand both algorithms and business is high, while grassroot employees may resist AI due to technology panic;

(4) The enterprises have various management systems which are not uniform in data format and are lack of interoperability mechanisms.

We suggest that the government provide services of "popularization + training + technology matchmaking", and set up special subsidies or "AI diagnosis + renovation" service for small and medium-sized enterprises, thus helping them learn new technologies and gradually adapt to the opportunities and challenges brought by AI.

2. Build regional AI infrastructure with major projects as the driving force

(1) France's approach to attract foreign investment to build AI data centers can be used as a reference. Relying on its important strategic position in the west, Chongqing is able to introduce or build its own AI computing center to form a regional AI industry cluster hub;

(2) By creating various scientific research such as "AI+" manufacturing joint laboratories and material research platforms driven by AI, Chongqing is able to lay an innovative foundation for integration of industry-university-research.

(3) Establish some special funds for the development of the artificial intelligence industry to support AI companies' R&D innovation, project implementation, talents import and training.

3. Promote AI in three major directions in the manufacturing industry

(1)Intelligent manufacturing process optimization

AI optimizes process flows and improves resource efficiency. We suggest that Chongqing government com-

bines AI with its pillar industries such as automobiles, electronics, and new materials to carry out pilot applications in quality prediction, equipment maintenance, and energy consumption control.

(2)New material research and development

Local universities and enterprises are encouraged to jointly establish AI+ new material development platforms, use machine learning to assist in the exploration of new material formulas and performance prediction, and accelerate the high-end and innovative development of the materials industry.

(3)Intelligent supply chain and market response

Learning from French companies in optimizing the supply chain through AI, Chongqing manufacturing companies are driven to build intelligent decision-making systems in demand forecasting, inventory management, logistics scheduling, etc., to enhance their capability in risk-resistance.

IV. Summary

At a time when global scientific and technological competition is becoming increasingly fierce, the French government attaches great importance to the core position of artificial intelligence in national strategy, and French companies are also making every effort to adapt to the changes and development of the AI era. The diversified applications of AI in process control, material research and development, and supply chain optimization, provide a vivid example for the intelligent transformation of the manufacturing industry.

France's experience in promoting the development of AI presents a systematic pattern of "national strategy, capital support, and industrial implementation." We sincerely hope that France's experience can provide reference and ideas for Chongqing to promote the development of advanced manufacturing and find its own way for future development. To solidify the foundation of intelligent manufacturing, Chongqing should systematically plan its AI development strategy, focusing on the popularization and support of small and medium-sized enterprises, directing resources toward AI infrastructure development, and prioritizing talent cultivation and the further integration of industry-university-research.

As the wave of AI sweeps the globe, we hope that Chongqing Government could seize the opportunities of the era. With policy guidance, industrial collaboration, and technological empowerment, the advanced manufacturing industry is equipped with "digital wings", and the city is to achieve a strategic leap from a "manufacturing powerhouse" to a "smart manufacturing hub"!

Generative AI Agents in the Lighting Industry: Transformative Impacts and Strategic Outlook

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1. Emerging Trends and Market Forecasts for GenAI Agents

Generative AI (GenAI) is evolving from a content creation tool into an "Agent" with autonomous decision-making and execution capabilities, marking a significant paradigm shift in the field of artificial intelligence. GenAI agents can understand complex instructions, decompose tasks, call upon tools, and collaborate with other agents to achieve specific goals. This emerging trend is rapidly reshaping various industries.

Market research institutions have expressed highly optimistic forecasts regarding this trend. According to a report by MarketsandMarkets, the market size of AI agents is projected to grow from $7.84 billion in 2025 to $52.62 billion in 2030, with a remarkable compound annual growth rate (CAGR) of 46.3%. Another report indicates that the broader generative AI market is expected to reach $71.36 billion in 2025 and grow to $890.59 billion by 2032, at a CAGR of 43.4%. Behind this exponential growth lies the core value of AI agents in automating complex business processes, delivering hyper-personalized experiences, and supporting real-time decision-making.

Currently, GenAI agents exhibit three key trends:

- Autonomy and Goal-Oriented Nature: The new generation of agents is no longer limited to passive response; instead, they can independently plan, execute tasks, and self-correct based on environmental feedback to accomplish more complex, multi-step tasks.

- Specialization and Microservices: General-purpose agents are being replaced by dedicated agents designed for specific industries or tasks (such as lighting system operation and maintenance, and energy consumption optimization). The latter offer higher efficiency and easier integration.

- Multimodal Interaction: Agents are evolving from text-only interaction to multimodal interaction that integrates images, sound, and sensor data. This enables them to perceive and understand the physical world more comprehensively, which is particularly crucial for industries like lighting that are closely tied to the physical environment.

1.1 From “Tool” to “Partner”: Paradigm Shift and Market Boom

The development of generative GenAI is approaching a decisive turning point: evolving from a “tool” primarily used for content creation into an “Agent” capable of independently understanding, planning, and executing complex tasks. This transformation is not only a technological leap but also a profound paradigm shift. Traditional software and AI models passively await instructions, while GenAI agents can proactively perceive the environment, set goals, allocate resources, and continuously learn, demonstrating unprecedented autonomy. They are evolving from the role of AI assistants to that of AI operation and maintenance specialists, or even experts capable of independently completing tasks.

This fundamental shift from passive response to active execution is the core driver behind the high market expectations for GenAI agents. The capital market and industry analysts generally believe that GenAI agents will become the core form of next-generation software applications and business process automation, with commercial value far exceeding that of simple content generation.

Market Forecasts:Major global market research institutions have shown highly consistent optimistic expectations for the GenAI agent market and its related sectors. Although specific data may vary, all point to a trillion-dollar blue ocean market:

- Vertical Application Market: According to the forecast by MarketsandMarkets, the market size of AI agents focused on specific tasks is expected to grow rapidly from $7.84 billion in 2025 to $52.62 billion in 2030, with an astonishing CAGR of 46.3%. This indicates that dedicated agents tailored to specific industries (such as smart lighting, industrial operation and maintenance, and financial analysis) will take the lead in achieving commercial implementation and large-scale deployment.

- Macroeconomic Market Size: The broader generative AI market (including agent technology) is also growing at a rapid pace. Bloomberg Intelligence predicts that the size of the generative AI market will grow from approximately $40 billion in 2022 to $1.3 trillion by 2032, an increase of more than 32 times over a decade. As a key carrier for realizing the value of GenAI technology, agents will be the core growth engine in this $1.3 trillion market.

- Enterprise Adoption Rate: Gartner forecasts that by 2026, more than 80% of enterprises will use generative AI APIs or models, or deploy GenAI-enabled applications in production environments, and agents will be one of the most transformative forms among these applications.

1.2 Three Emerging Trends of GenAI Agents

Trend 1: From General-Purpose to Specialized Although general-purpose AI agents have demonstrated great potential, they often face issues such as low efficiency, high costs, and unreliable results in practical commercial applications. Consequently, the market is rapidly shifting towards the development of specialized agents designed

for specific industries and business processes. These agents possess deeper domain knowledge, more precise toolkits, and optimized decision-making logic within limited fields. In the lighting industry, a general chatbot may fail to understand the subtle differences between the impacts of “color temperature” and “illuminance” on employees’ moods. In contrast, a “lighting optimization agent” is specifically trained to understand building physics, ergonomics, and energy management knowledge. It can call upon lighting control APIs, light sensors, and energy consumption analysis tools to achieve the dual optimization of energy conservation and employee comfort. This specialization enables more accurate decision-making and more efficient deployment.

Trend 2: From Individual Intelligence to Group Collaboration The capabilities of a single agent are limited. Future complex tasks will be completed through collaboration among a cluster of agents. In this system, different agents play different roles, similar to a team of human experts. For example, a “planning agent” is responsible for task decomposition, an “data analysis agent” handles information processing, an “execution agent” calls upon tools, and an “auditing agent” checks the results.

Trend 3: From Digitally Native to Physical Interaction GenAI agents are moving from the purely digital world to the physical world. Through in-depth integration with the Internet of Things (IoT), robotics, and sensor networks, they can directly perceive and control physical devices. This trend of “cyber-physical fusion” is crucial for the implementation of agents in industries such as lighting, manufacturing, and logistics. Agents are no longer limited to data analysis; instead, they have become a bridge connecting digital intelligence and the physical world. When a “lighting operation and maintenance agent” predicts, through data analysis, that a lamp in a certain area may fail within 48 hours, it does not merely generate a warning on the screen. Instead, it independently performs a series of actions in the physical world: first, it calls upon the lighting system API to attempt a remote restart or adjust the lamp’s parameters; if this is ineffective, it checks the spare parts inventory and automatically creates a work order in the operation and maintenance system, including the precise location, fault type, and required spare parts; finally, it directly dispatches the work order to the mobile terminal of the nearest engineer with the appropriate skills. This fully demonstrates a closed loop from digital prediction to physical intervention.

In summary, GenAI agents are on the verge of an era of exponential market growth. Their development trends clearly point towards greater specialization, enhanced collaboration, and deeper integration into the physical world. For industries like lighting, which heavily rely on physical devices and environmental perception, this not only means improved efficiency but also heralds the arrival of a brand-new service model and business ecosystem driven by data and intelligence.

2.Understanding GenAI Agents in the Lighting Context

Applying the concept of GenAI agents to the lighting industry means transforming traditional, passive lighting infrastructure into an “Agent” that can proactively perceive the environment, conduct multi-objective reasoning, and independently implement optimization strategies. It is no longer merely a provider of light but also a

manager and optimizer of the spatial environment. To understand this transformation, we need to analyze it from three dimensions: its core decision-making mechanism, enabling tools, and transformative potential.

2.1 Core Cyclic Decision-Making: The "Thinking" Process of Lighting Systems

The operation of GenAI agents in the lighting context follows a continuous, closed-loop decision-making process, which can be summarized as the "Perceive-Plan-Act" cycle. This cycle is the foundation for lighting systems to achieve autonomous intelligence.

① Perceive: Multi-Dimensional Environmental Information Input This is the basis for the agent's decision-making. It constructs a comprehensive understanding of the physical environment and user needs through a variety of data sources. These data sources include:

- Internal State Data: Real-time status of individual lamps (brightness, color temperature, energy consumption), equipment health, and operational history.
- Environmental Sensor Data: Dynamic environmental information collected through IoT sensors throughout the space, such as illuminance sensors (to perceive natural light intensity) and infrared/millimeter-wave radars (to detect the presence and movement of people).
- External Associated Data: Access to third-party data APIs to obtain a more macroscopic basis for decision-making, such as weather forecasts (which affect natural light), real-time peak and off-peak electricity prices of the power grid, building meeting room reservation systems, urban traffic flow data, or public event calendars.

② Plan: Multi-Objective Dynamic Strategy Generation Based on Large Models This is the "brain" and core value of GenAI agents. It receives large volumes of multi-dimensional data from the perception layer and conducts complex reasoning and planning based on preset core objectives (such as maximizing energy savings, optimizing user comfort, meeting specific scene atmosphere requirements, and extending equipment lifespan). Unlike traditional automation based on fixed rules, GenAI planning is generative and dynamic:

- Multi-Objective Trade-Off: The agent can understand and balance multiple, sometimes conflicting, objectives. For example, maximizing the use of natural light to save energy while ensuring visual comfort.
- Predictive Planning: It not only responds to the current state but also predicts future trends based on data. For instance, predicting that more employees will enter the office area in the afternoon and proactively planning and smoothly adjusting the lighting scheme in advance, rather than making sudden changes after people enter.
- Strategy Generation: It can generate new and unprecedented lighting strategies. For example, automatically generating a dynamically changing lighting scene that stimulates creativity according to the needs of

a creative brainstorming session.

③ Act: Interaction with the Physical World Through Toolkits After planning, the agent needs to translate abstract strategies into precise control over thousands of lighting nodes in the physical world. This step is accomplished by calling upon a "business toolkit". The agent decomposes the generated strategies into a series of specific instructions and issues them to lighting devices through control protocols to complete actions such as dimming, color adjustment, and on/off switching. After the action is executed, the system state changes, and the perception layer captures these new changes, thereby initiating a new "Perceive-Plan-Act" cycle and forming a closed-loop system that continuously optimizes and adjusts itself.

2.2 Business Toolkit: The "Hands and Feet" Empowering Agents

If large models are the "brain" of agents, then the business toolkit is the "hands and feet" that connect and control the physical world. Without these tools, the agent's plans cannot be implemented. In the lighting field, this toolkit mainly includes:

- Device Control APIs: The most core tools that allow the agent to perform refined control over individual lamps or lamp groups, such as setting brightness percentages and specific color temperatures in Kelvin.
- Data Query APIs: Used to retrieve real-time or historical data from various databases and sensor platforms, providing input for the "Perceive" phase.
- Analysis and Diagnostic Tools: Calling upon data analysis models or algorithms for energy consumption trend analysis, equipment fault prediction, and lighting environment quality assessment.
- External Service Integration: Interfaces for linking with other systems, such as connecting to enterprise calendar management systems (Outlook/Google Calendar), building automation systems (BAS), operation and maintenance work order systems (e.g., ServiceNow), and even social media platforms to obtain a richer context for decision-making.

By endowing GenAI agents with the ability to use these tools, they are transformed from pure language models into powerful executors capable of actually solving industry problems.

2.3 Transformative Potential of GenAI Agents for the Lighting Industry

The introduction of GenAI agents will fundamentally reshape the value chain and business model of the lighting industry, with its potential reflected in three levels of leapfrog development:

① Value Leap: From "Lighting Products" to "Light Environment Services" The focus of the industry will shift from selling lighting hardware to providing continuously optimized, subscription-based "Lighting as a Service (LaaS)". Customers will no longer purchase a static product but a spatial experience that is adaptive,

self-learning, and continuously evolving.

② Role Leap: From "Isolated Facilities" to "Smart Space Hub" Smart lighting systems will become the central perception network of smart buildings and smart cities. The high-value data collected by their sensors throughout the space, such as space occupancy, pedestrian flow density, and environmental changes, can provide a basis for decision-making for other systems in the building, such as security, heating, ventilation, and air conditioning (HVAC), and space management. This makes the lighting system a core data hub in the entire smart ecosystem.

③ Model Leap: From "Passive Response" to "Predictive Operation" The operation and maintenance model will undergo a disruptive change. Agents can predict equipment failures, independently diagnose problems, and automatically generate and dispatch maintenance work orders. This transforms the traditional passive "repair-after-breakdown" model into an active, predictive operation model, thereby significantly reducing operation and maintenance costs and improving system reliability.

3. Transforming Lighting: Key Applications of Generative AI Agents

3.1 Intelligent Lighting Control and Personalized Experiences

GenAI agents elevate the level of lighting control from rule-based "automation" to a new height of autonomous "intelligence" and "humanization". They can simultaneously handle and optimize the efficiency and safety of the macro environment, as well as the comfort and health of micro-individuals, seamlessly integrating these two levels.

In terms of intelligent lighting control, GenAI agents demonstrate strong global optimization and predictive capabilities, particularly in complex systems such as cities and buildings. Taking public lighting in smart cities as an example, GenAI agents act as the "urban lighting brain". They integrate real-time data from multiple dimensions, such as transportation, meteorology, and public security, and no longer rely on simple light sensing or time control. For instance, before the end of a large-scale event, they can predict the route and scale of pedestrian evacuation and proactively and dynamically increase the brightness of lighting on relevant streets to ensure public safety; when receiving a severe weather warning, they can independently enhance the brightness and penetration of streetlights in affected areas to prevent traffic accidents. This type of control is proactive and predictive, achieving a qualitative change from "on-demand response" to "pre-emptive action".

Similarly, in building management, agents can coordinate the lighting system with the needs of the energy network, becoming an important tool for achieving the "dual carbon" goals. They track real-time peak and off-peak electricity prices and carbon emission factors of the power grid and independently implement the "peak-shaving and valley-filling" strategy. During peak electricity consumption periods, they moderately reduce energy consumption in non-essential areas while ensuring the lighting standards of core functional areas; during off-peak periods when the power grid is dominated by clean energy, they can make full use of "green electricity".

This intelligent linkage with the external energy environment transforms the lighting system from a simple energy-consuming unit into a flexible load that is friendly to the energy network and has regulatory capabilities.

In terms of personalized experiences, GenAI agents truly realize the “people-oriented” lighting concept. They shift the focus of services from the “space” to “each individual” in the space. In modern office environments, with user authorization, agents can learn each person’s work habits and circadian rhythms. They can provide dynamic “light environment solutions” based on the user’s schedule: automatically generating clear, high-illuminance cool light when the user needs to focus on in-depth work; switching to a softer, energy-stimulating light environment during creative collaboration.

The pinnacle of this personalized experience is reflected in the natural language interaction between humans and the light environment. Users do not need to understand complex parameters; they only need to express their emotional and vague needs, such as “I feel a bit tired today; please turn on some lights that can boost my spirits”. The GenAI agent can understand their intentions and, combined with the current time, weather, and other contexts, immediately generate a unique, dynamic light scene that can lift their mood.

In summary, by combining efficient intelligent control with ultimate personalized experiences, GenAI agents not only significantly improve the energy efficiency and management level of lighting systems but, more importantly, elevate light from a basic physical environmental element to a dynamic service that can proactively adapt, interact in depth, and care for individuals, thereby completely transforming the value connotation of lighting.

4. Future Outlook and Strategic Recommendations

Generative AI (GenAI) agents paint a grand blueprint for the future development of the lighting industry. For Chongqing, a city dedicated to building an international, green, and smart metropolis, seizing this technological wave and applying it to key areas of urban governance and industrial upgrading carries significant strategic significance. This chapter focuses on the application of GenAI in two major directions—smart city management and support for the “dual carbon” goals—and puts forward specific recommendations for Chongqing.

4.1 How GenAI Empowers Smart City Management (Operation and Maintenance - City - Enhancing Operational Efficiency)

As the most widely covered municipal infrastructure, urban streetlights have a direct bearing on the efficiency and cost of urban governance through their intelligent operation and maintenance (O&M) capabilities. Compared with the traditional models of manual inspection and passive fault reporting, modern smart city lighting management systems have been deeply integrated with artificial intelligence technology, achieving a leap from “remote network management” to “AI empowerment”. This advancement is mainly reflected in the following three aspects:

AI-Enabled Intelligent Strategies: Realizing Refined and Adaptive Lighting Control

The AI-driven strategy center frees urban lighting from the previous extensive "one-size-fits-all" management approach, enabling refined and dynamic control in response to complex and changing environments.

- Intelligent Strategy Creation and Dynamic Optimization: The system can intelligently develop basic lighting strategies based on factors such as road classification, regional functions, and historical pedestrian/vehicle flow data. It can also dynamically optimize these strategies by accessing real-time traffic flow sensors or third-party map data—for example, automatically increasing brightness during peak traffic hours to ensure safety, and appropriately reducing brightness during off-peak hours to save energy, thereby achieving "on-demand lighting".

- Natural Language Human-Machine Interaction and Strategy Modification: Managers do not need to perform complex programming or interface operations; instead, they can issue instructions directly through natural language. For instance, they might say, "For the marathon event, please increase the lighting brightness of the roads around Jiefangbei by 30% from 8 pm to 11 pm tonight". AI can accurately understand the intent of such instructions and convert them into executable control commands.

- Reliable Strategy Distribution and Full-Scale Execution: Complex, dynamic, or temporary lighting strategies generated by AI can be efficiently and reliably decomposed by the system and distributed to thousands of lighting terminals across the city. This ensures that instructions are accurately executed at both the macro and micro levels, forming a complete control loop.

AI-Enabled Intelligent O&M: Building a Predictive and High-Efficiency O&M Loop

The application of AI in O&M is driving a fundamental shift from "passive response" to "proactive prediction", significantly improving the efficiency and accuracy of fault handling.

- Intelligent Aggregation and Diagnosis of Alarms: AI can intelligently aggregate and conduct correlation analysis on massive volumes of raw alarm data. For example, if multiple lamps on the same circuit go offline simultaneously, AI will correlate this into a single "network failure" rather than multiple "individual lamp failures". It will also assess the urgency of the issue based on the impact on core areas such as main roads. This greatly reduces information noise and helps O&M teams quickly identify road faults requiring urgent repair.

- Root Cause Analysis and Maintenance Solutions: By analyzing subtle fluctuations in voltage and current, combined with factors such as equipment service life and weather conditions, AI can determine the root cause of a fault—such as "aging of the driving power supply" or "damage caused by transient voltage surges"—and automatically generate recommended maintenance solutions.

- Documentation Support and Assistance: While generating maintenance solutions, AI can automatically retrieve and push relevant supporting documents from a vast knowledge base, such as the lamp's specifi-

cation sheet, historical maintenance records, or guidelines for handling similar faults. This provides front-line engineers with one-stop intelligent guidance.

AI-Enabled Data Insights: Transforming Data into Actionable Decision-Making Basis

- Natural Language-Interactive Reports: Without the need for professional database knowledge, managers can query charts through natural language (e.g., "Generate a pie chart of streetlight failure rates across districts last week") or request customized reports. AI can understand these requests and instantly generate visualized data results, lowering the threshold for data analysis.

- Intelligent Analysis and Interpretation: The system can automatically generate intelligent daily, weekly, and monthly reports. Unlike traditional reports, AI provides analysis and interpretation of key data in the reports, automatically generating summaries and insights. For example, it might state, "This month's energy consumption decreased by 5% month-on-month, mainly driven by strategy optimization in XX District; however, the failure rate in XX District has increased and requires attention".

- Cross-Domain Data Correlation Analysis: AI can conduct correlation analysis between lighting system data (such as pedestrian flow density sensed by sensors) and other urban data (such as public transportation and commercial activities). This helps identify potential patterns in urban operations and provides data support for decision-making in other areas, such as commercial planning, public safety, and traffic optimization.

4.2 How GenAI Supports the "Dual Carbon" Goals (Energy Consumption - Office - Lighting Data Services)

Office buildings are among the major sources of urban energy consumption and carbon emissions. As a significant energy consumer, their lighting systems serve as a key breakthrough for achieving the "dual carbon" goals (reaching peak carbon emissions before 2030 and achieving carbon neutrality before 2060). The application of GenAI agents not only enables extreme optimization of lighting energy consumption but, more importantly, transforms lighting systems into dynamic and intelligent "carbon management" platforms.

① AI-Enabled Intelligent Strategies: Refined Carbon Reduction Strategies

The core of AI-enabled intelligent strategies lies in converting the abstract "dual carbon" goals into optimized lighting behaviors that can be automatically implemented in every space and at every moment.

- Precise Strategy Generation and Scenario-Based Carbon Reduction: Managers can quickly generate energy-saving strategies through natural language instructions (e.g., "Create a constant illuminance strategy based on natural light for all open office areas"). Meanwhile, AI can automatically generate default, scenario-specific energy-saving strategies that are highly adapted to different space attributes—such as

meeting rooms, private offices, and corridors. This fundamentally eliminates energy waste and lays the foundation for refined, scenario-based carbon reduction.

- Self-Evolving Optimization of Energy Efficiency and Sustained Carbon Reduction: Based on historical operational data, the AI system can continuously analyze multi-dimensional indicators such as space occupancy rate, energy consumption, and energy-saving rate, and automatically recommend optimized lighting strategies. This self-evolving capability ensures that the lighting system can constantly adapt to changes in personnel behavior and the environment, achieving an optimal dynamic balance between energy efficiency and comfort, thereby enabling sustained and in-depth carbon reduction.

- Goal-Oriented Energy-Saving Modes: The system has three built-in strategy orientations—"comfort first", "energy saving first", and "balanced mode"—allowing managers to directly integrate the enterprise's macro operational goals into the lighting management logic. Choosing the "energy saving first" mode means AI will prioritize maximizing carbon emission reduction when optimizing all lighting behaviors, enabling differentiated and goal-driven carbon reduction management.

② AI-Enabled Intelligent O&M: Ensuring System Energy Efficiency

Intelligent O&M is not only about equipment maintenance but also directly related to whether the lighting system can operate stably within the optimal energy efficiency range over the long term. Every link in this process holds potential for carbon reduction.

- Fault Diagnosis and Early Warning of Energy Efficiency Attenuation: The system can automatically identify and classify equipment alarms, forming structured O&M records. AI can issue early warnings for energy efficiency degradation issues such as "light decay". By identifying and prompting the replacement of lamps that are "still functional but inefficient" in advance, it ensures that every kilowatt-hour of electricity is used most effectively, safeguarding carbon efficiency at the equipment level.

- Systematic Energy Saving: Through fault analysis, AI can accurately pinpoint whether the root cause of a problem lies in the lamp, sensor, or control logic. For example, an incorrectly configured sensor might cause lights in an entire area to remain on continuously, creating a significant energy "black hole". AI's root cause analysis capability can quickly locate and resolve such systemic issues, ensuring the integrity and effectiveness of the entire energy-saving system.

- Low-Carbon O&M: The precise maintenance recommendations and documentation provided by AI not only improve the efficiency of individual maintenance tasks but also directly reduce transportation-related carbon emissions and material consumption during the O&M process by minimizing misjudgments and repeated service visits. This lean maintenance model embodies the principles of green operation and resource conservation inherent in the "dual carbon" concept.

③ AI-Enabled Data Insights: Providing "Measurable, Optimizable" Carbon Management Data Services

To achieve the "dual carbon" goals, the prerequisite is the "measurability, reportability, and verifiability" of carbon emissions. AI's data insight capabilities transform the lighting system from an "energy-consuming unit" into a "carbon data service center".

- Transparent Energy Consumption and Carbon Footprint Accounting: Through natural language interaction, any manager can easily query energy consumption data for any area and time period, and AI will automatically provide analysis and interpretation. The system can directly convert energy consumption data into carbon emissions, providing enterprises with near-real-time carbon footprints of their lighting systems and making carbon reduction achievements clear and transparent.

- In-Depth Exploration of Energy-Saving Potential: By combining regional energy consumption data with space occupancy rates, AI can conduct in-depth energy consumption analysis to accurately identify spaces with the greatest energy-saving potential—such as those with "abnormally high energy consumption but low utilization rates". Beyond identifying problems, it also proposes comprehensive optimization solutions, such as "suggest adjusting the sensitivity of sensors in this area" or "suggest adopting a stricter no-occupancy lighting strategy".

- Intelligent Reporting and Data Empowerment: The system can automatically generate multi-dimensional intelligent reports and support natural language interpretation. These reports can be directly used as data sources for green building initiatives and energy-saving carbon reduction efforts in the enterprise's Environmental, Social, and Governance (ESG) reports. This provides strong data support for the enterprise's "dual carbon" commitments and formally elevates lighting data to a valuable asset in the enterprise's sustainable development strategy.

5. Challenges and Strategic Considerations

While embracing the opportunities brought by GenAI agents, we must also confront the challenges they present:

5.1 Technical Barriers, Data Requirements, and Scalability

- Model "Hallucinations" and Anti-Interference Capabilities: GenAI large models are prone to "hallucinations"—generating outputs that appear plausible but are inconsistent with facts. In lighting O&M scenarios, a single "hallucination" could lead to incorrect fault diagnosis or the development of hazardous lighting strategies. Additionally, as quasi-public service facilities, lighting systems have extremely high anti-interference requirements. Ensuring that AI agents operate stably 24/7 and have a secure failover mechanism in extreme situations (such as network outages) is a technical challenge that must be ad-

dressed.

- Acquisition and Governance of High-Quality Data: The performance of AI models is highly dependent on the quality of the data used for training, following the principle of "garbage in, garbage out". For cities or buildings, the challenge lies in acquiring and governing high-quality, highly consistent labeled data from tens of thousands of sensors and devices with different brands, models, and installation eras. The costs of data cleaning, alignment, and labeling are substantial, and the continuous supply of data is a prerequisite for the model's ongoing evolution—placing extremely high demands on data governance capabilities.

- Scalability from Pilot Projects to Large-Scale Deployment: A system that performs excellently in a pilot project for a single building or neighborhood may face enormous scalability challenges when expanded to cover millions of equipment nodes across an entire city. This not only tests the computing power, storage capacity, and network bandwidth of cloud computing but also challenges the design of the entire system architecture. Achieving low-latency responses and concurrent processing of massive data at a reasonable cost is the key to determining whether the project can be promoted on a large scale.

5.2 Ethical Impacts, Privacy Issues, and Human-Machine Collaboration

- Privacy Boundaries of Spatial Data: Smart lighting systems use various sensors to detect space occupancy and personnel activities, which inevitably touches on the sensitive boundary of personal privacy. Ensuring that data collection and use comply with laws and regulations, have clear purposes, and undergo effective anonymization to protect the privacy rights of citizens and employees is an ethical bottom line that must be upheld. A lack of transparent privacy protection policies will seriously undermine public trust in the technology.

- Algorithm Fairness and Potential Bias: The decision-making logic of AI is derived from the historical data it learns from. If historical O&M data shows that repair response times in certain areas are inherently faster than in others, AI may inadvertently learn and solidify this bias, leading to unfair allocation of public service resources. When designing AI agents, it is essential to proactively introduce fairness auditing mechanisms to ensure that their decision-making logic is fair and non-discriminatory for all regions and groups.

- Trust and Responsibility Attribution: In highly intelligent systems, the collaborative relationship between humans and machines needs to be redefined. While AI can provide accurate diagnosis and recommendations, how to allocate final decision-making authority and responsibility? Clear supervision and intervention mechanisms must be established to define the role of humans at key decision points. When an incorrect AI decision causes losses, determining responsibility attribution—whether to developers, operators, or users—is a complex issue that needs to be clarified at both the legal and management levels.

5.3 Integration with Legacy Systems and Workforce Adaptation

- Integration Costs of Heterogeneous Legacy Systems: The lighting infrastructure of most cities and buildings is constructed in batches and phases, resulting in a large number of legacy systems with different brands, ages, and communication protocols. The technical difficulty and transformation costs of effectively integrating these "technical silos" with advanced GenAI agent platforms can be extremely high. Finding an economically feasible, phased integration path that balances protecting existing investments with full-scale replacement is a practical challenge.

- Skill Transformation of the Existing Workforce: GenAI-enabled intelligent O&M will significantly change the nature of work for lighting O&M personnel. The importance of traditional "hands-on" electrician skills will relatively decrease, while "human-machine collaboration" skills—such as understanding AI diagnostic reports, using digital tools, and verifying data—will become crucial. This requires city managers and enterprises to invest resources in large-scale skill retraining for the existing workforce to help them adapt to the new work model.

- Organizational Culture Acceptance: The introduction of disruptive technology is not just about installing new software; it also impacts traditional work processes and organizational culture. Employees may resist the technology due to fear of the unknown, concerns about job displacement, or distrust of machine decisions. Therefore, alongside technology deployment, it is equally important to establish an organizational culture that encourages innovation, embraces data, and trusts human-machine collaboration through thorough communication, pilot demonstrations, and empowerment training.

Theme: Building an AI Application Hub to Enable High-Quality Industrial Development

Y.K. Pang
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Executive Summary

This 19th meeting of the Chongqing Mayor's International Economic Advisory Council (CMIA) offers an excellent opportunity to bring together Chinese and international perspectives on the development of AI, and to consider what role Chongqing might play in its further development.

China is playing a leading role in the development of AI and its commercial applications. The Chinese government has also taken welcome steps to promote responsible global governance of AI.

Our research suggests that the application of AI is already changing business practices for many companies in Chongqing, heightening efficiency and sustainability. This has the potential to strengthen Chongqing as a key economic and industrial centre in central-western China and build an AI application hub to enable high-quality industrial development.

Jardine Matheson remains committed to its long-term engagement with China and in Chongqing, as the Group continues its evolution and business transformation. The application of AI across our businesses contributes to their evolution and embedding sustainability is a key priority for the Group – both of these are reflected in the examples of AI application outlined in this paper.

We welcome the opportunity this CMIA provides to engage further with Chongqing's strategic development, and to understand the role that AI can play in this.

1.Introduction

The development and application of Artificial Intelligence (AI) is one of the central issues facing business and governments today. This 19th meeting of the Chongqing Mayor's International Economic Advisory Council (CMIA) offers an excellent opportunity to discuss these issues, and provides a platform for dialogue between Chinese and international perspectives.

In Chongqing and other cities in China, the application of AI is already changing business practices in many

fruitful and productive ways. Meanwhile, the broader global governance challenges have been recognised in China and elsewhere. Integrating these various agendas and perspectives is essential to ensure the positive ongoing application of AI to our economies and societies.

We have observed the emphasis that the Chinese government at all levels places on these issues. The discussion of AI at the 20th Central Committee Politburo Study Session in April 2025 demonstrated the strategic importance that the Chinese leadership attaches to AI innovation, industrial growth and application. China has many advantages in AI, and the emergence of DeepSeek last year served as a wake-up call to those outside China who were not previously aware of potential Chinese strengths in these areas.

As a key economic and industrial centre in central-western China, Chongqing has already established a notable profile in the application of AI, especially in manufacturing. This meeting provides an opportunity to explore these issues further, and to work on integrating China's resilience in AI development with international cooperation in AI. Proactive strategic thinking will help Chongqing achieve its goals of building an AI application hub to enable high-quality industrial development.

Jardine Matheson's (JM) portfolio primarily consists of services companies, and this has informed our choice of Topic III for this paper. After some further discussion of the broader context, the paper will reflect on our understanding of AI development in Chongqing, outline some examples of AI application in JM companies, and offer concluding comments and recommendations on the development of AI and modern services in Chongqing.

2.Global and national context

The wider context for this meeting remains one of well-documented global geopolitical and economic uncertainty. The environment for transnational businesses is a challenging one. But alongside these challenges are structural shifts in global power and influence, both political and economic as the Global South continues to grow in importance and dynamism. China has embraced the opportunities these changes bring, building stronger relationships across the Global South whilst looking to manage its relationships with the US and other Western economies in a responsible and productive manner.

In this context, we look forward to understanding the Chinese government's strategic plans for the coming years. This year marks the last year of the 14th five-year plan period in China's policy making (2021-2025) and we understand that preparations are underway for the development of the 15th five-year plan (2026-2030). As we discussed at last year's CMIA, there are indications that the government will continue its emphasis on high-quality development and its encouragement of innovation, strengthening the domestic economy while engaging and cooperating internationally. We welcome the Chongqing government's engagement with international businesses and its commitment to further enhancement of the business environment.

The policy environment is propitious for the further development and application of AI. We expect that AI

will feature prominently in this next phase of China's planning, to drive forward Chinese-style modernization and enhance industrial and economic productivity and efficiency. Analysts have observed numerous advantages that China has in the development of AI. China's manufacturing and business ecosystems have developed strong innovative capacity over the last two decades, particularly in application of new technologies. Companies have demonstrated leadership in intelligent manufacturing, digital marketing and smart customer service. The scale of China's market and availability of data is driving the efficient application of AI. China also benefits from cost advantages, from hardware through to talent. Development of AI in China has been particularly strong in cities such as Beijing, Shanghai, Shenzhen and Hangzhou. But there are also challenges recently acknowledged by the government, such as the need to avoid unhealthy competition or 'involution'.

Beyond commercial development of AI, the Chinese government hosted the World AI Congress (WAIC) in Shanghai in July this year. This demonstrated China's commitment to the responsible global governance of AI. The Global AI Governance Action Plan released at the Congress set out numerous goals: to promote the development and innovation of AI and seize the opportunities that AI presents, to advance industrial development through the use of AI, and to speed up digital infrastructure development. It further advocated a diverse and open innovation ecosystem and the supply of high-quality data. 'Sustainable AI' was another theme, to address the energy use and environmental challenges that the development of AI brings. Other challenges to be met include developing consensus on standards and norms, strengthening the governance of AI safety and its use by public sector bodies. It is clear that China wants to develop resilience and autonomy in AI where possible, but the WAIC also advocated greater international cooperation in capacity building and an inclusive global governance model in which all relevant stakeholders participate.

We welcome these principles, and hope that others will engage in positive global governance of AI and focus on serving the needs of societies, alongside the development of its commercial potential.

3.AI application in Chongqing

We believe Chongqing has strong potential to develop further its strategic positioning as a key economic centre in central-western China. Many of the elements underpinning this have been discussed in previous CMIA meetings, from the municipality's geographical strategic positioning at the intersection of the Belt and Road Initiative and Yangtze River to the development of the New International Land-Sea Corridor from Chongqing to China's southwestern coast. These strategic advantages give the municipality opportunities to benefit from the latest infrastructure development plans and further strengthen its economic importance.[1]

It is evident that companies in Chongqing are already using AI in various ways to support the further development of their businesses. AI application in line with national policy has the potential to strengthen further

[1] 今年 *8000* 亿元“两重”建设项目清单全部下达完毕 , *https://www.gov.cn/yaowen/shipin/202507/content_7030416.htm*

Chongqing's strategic importance within China's economy and the global competitiveness of its economy. Some of the following examples of proactive adoption of AI by businesses in Chongqing, which we studied in preparation for this CMIA meeting, illustrate the progress and potential.

A good example comes from the automotive and electric vehicle sector, one of Chongqing's key industries. The automaker Seres (in which JM has a partnership through its portfolio company, Zhongsheng, see next section) has enhanced its automated processes to more than 50 percent. The Seres Super Factory, opened in 2024, is equipped with advanced AI-powered systems. An AI visual inspection system uses a deep learning algorithm to conduct tests and assess the efficiency of testing, with more than 40 AI stations around the plant. By using intelligent robotics, machine learning and data analytics, the factory can improve quality and speed, optimizing production processes in real-time. In quality control, AI-driven systems can predict potential issues before they occur and ensure that all vehicles meet the highest safety and performance standards.[2]

At the 2025 World Intelligent Vehicle Conference (WIV) held in July in Chongqing, Seres' Chairman, Zhang Xinghai, spoke of the dissolving of the boundaries of the traditional auto industry as cars have become integrated intelligent platforms. This requires new approaches to business collaboration across sectors, rather than the traditional model where car manufacturers were at the apex of a linear supply chain. This leads to the creation of a new ecosystem which brings together companies across technology, energy and telecoms. At the WIV, Mr Zhang noted that Seres has entered into partnerships in design and marketing with technology company Huawei, and collaborated with CATL in embedding battery production lines directly into Seres' assembly plants. These collaborative efforts can improve consistency and better integrate the production process. The WIV also discussed the concept of embodied AI (embodied AI robots are able to interact with and learn from their environments and can therefore make autonomous decisions and perform actions in areas that require 'human-like motions').[3] Research labs at Chongqing University are also doing research into embodied AI robots.[4]

Chongqing is home to interesting examples of AI application in other sectors. Midea Building Technologies - which specializes in manufacturing large-scale central air conditioning systems - has developed the world's first full-process AI-empowered chiller lighthouse factory in Chongqing (as the most advanced factories globally, lighthouse factories represent world-leading intelligent and digitalized manufacturing). AI systems help Midea deal with challenges such as growing demand for customized orders and greater complexity in quality control. Machine learning and augmented reality can be used to explore new production models, from intelligent design and agile production to customized delivery. The company reports an 81 percent reduction in chiller selection cycles, a decline of 45 percent in product design cycles, and a fall of 31 percent in maintenance rates. AI-powered diagnostics can proactively predict faults and performance degradation, offering smart operation and maintenance recommendations via the mobile app and the computer system. According to Midea, these measures have reduced

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[2] *iChongqing at https://youtu.be/mNH63yQ5gW4?si=nH_6Z2Ukr0ITwKbN*

[3] *https://www.ichongqing.info/2025/08/01/global-experts-gather-in-chongqing-to-explore-chinas-ai-driven-auto-push/*

[4] *https://digitalpaper.stdaily.com/http_www.kjrb.com/ywtk/html/2025-01/11/content_583271.htm?div=0*

market service complaints by 37 percent and in-warranty maintenance costs by 21 percent.[5]

Another example is Sany (Chongqing)'s use of robots in tasks such as welding, substantially reducing human intervention in production.[6] Huawei has been engaged in AI development in Chongqing for a number of years, having established the Huawei (Chongqing) Artificial Intelligence Innovation Center in August 2019. This has supported cloud adoption and industrial digitalisation.[7] We also noted that at last year's CMIA, HP signed a Memorandum of Understanding (MoU) with Chongqing on developing AI, and has worked with Chongqing University.[8] AI has also been used in public services and business, and the Social Experiment Study on Chongqing's AI Innovation Development Pilot Zone identifies AI needs and challenges in public services and business operations, aiming to bring together innovation and practical application.[9]

Many of these examples lie in manufacturing or in the integration of services and manufacturing. The next section of this paper introduces latest developments in JM's strategy and outlines some examples of AI adoption by its portfolio companies.

4.Jardine Matheson's approach

The Jardine Matheson Group is a long-standing member of the Chongqing Mayor's International Economic Advisory Council, and Mr. Ben Keswick has served as a member since 2012. Over the years, JM has invested and developed business in China and in Chongqing. We remain strongly committed to China as a key market. Meanwhile, our overall business strategy has continued to evolve.

In 2024, JM's performance was resilient as the Group refocuses its approach through continuous evolution and business transformation. At the Corporate level, JM will focus on the development of our portfolio of market-leading businesses across Asia to deliver long-term growth and sustainable returns for shareholders. This portfolio of companies and the environment they operate in will continue to evolve and our portfolio companies have been conducting strategic business reviews and revising strategies where necessary to meet the changing environment and the goals of the Group.

A key driver of our approach is to embed sustainability in everything we do. This is central to our long-term vision, with a particular focus on climate action. Our portfolio companies have development ambitious medium-term science-based decarbonisation targets and credible pathways to meet these targets. Issues of sustainability

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[5] *https://mbt.midea.com/global/news/ai-zero-carbon--the-world-s-first-fully-ai-powered-chiller-light*

[6] *https://www.chinadaily.com.cn/a/202403/08/WS65ead7b3a31082fc043bb927.html*

[7] *https://www.chinadaily.com.cn/regional/chongqing/liangjiang/2021-12/21/content_37549234.htm*

[8] *https://www.ichongqing.info/2024/09/29/hps-strategic-ai-partnership-supports-chongqings-vision-as-a-smart-manufacturing-insights/*

[9] *https://www.ichongqing.info/2024/11/21/chongqing-ai-study-reveals-key-challenges-in-public-services-business-insights/*

are considered in all investment decisions.

Jardine Matheson oversees a portfolio of businesses which are leaders in their markets across our core geographies of China and Southeast Asia. It has 100 percent ownership of Jardine Pacific which holds a number of businesses operating across three main sections, engineering, consumer and transport services; 54 percent of Hongkong Land; 77.5 percent of DFI Retail; 88 percent of Mandarin Oriental; and 85 percent of Jardine Cycle & Carriage. Jardine Cycle & Carriage has a 50.1 percent interest in Astra. The Group also has a long-standing strategic partnership with, and holds a 21.4% interest in, the Zhongsheng Group.[10]

Jardine Matheson in Chongqing

As we have demonstrated throughout our participation in CMIA meetings, Jardines has made a substantial commitment to Chongqing. Jardines returned to Chongqing in the 1990s following the development of China's economy under 'reform and opening up' and with a view to the promising potential for growth in central-southwest China. Several decades later, Jardines is one of the largest foreign investors in Chongqing. Our total investment of US$9 billion spans real estate, automotive dealerships, and restaurants. In 2024, Jardines' related businesses in Chongqing, including joint ventures and associate companies, generated a total revenue of RMB8 billion and employed over 1,100 staff.

The Jardine Matheson (China) Limited Chongqing Representative Office opened in 2012 and covers Southwest and Central China. In the real estate sector, Hongkong Land (HKL) has been active in Chongqing for over two decades. It has 16 major projects in Chongqing, primarily consisting of residential properties with commercial components, including four commercial projects under 'The Ring' series and one 'CENTRAL' development. These projects are located in prime city areas and have established a strong reputation in markets. HKL has 440 employees in Chongqing. In 2024, it achieved contracted sales (on a 100% basis) of approximately RMB7.4 billion in Chongqing, ranking first among all developers, while leading in average transacted unit price. HKL operations in Chongqing also embed sustainability, for example at The Ring, Chongqing, where PV panels on the roof of the shopping mall generated 68,399 kWh of electricity in 2024, used to power the underground car park lighting and further reducing the complex's carbon emissions.[11]

Jardines' associate business, Zhongsheng Group, currently has eight dealerships in Chongqing, representing six brands (two Mercedes Benz, two Toyota, BMW, Audi, Lexus and AITO).. While Zhongsheng has faced challenging market conditions across China, we believe that the business has strong fundamentals, from market insights to operational capabilities, and will continue to partner with leading auto brands. An example of its business development can be seen in Chongqing, where (in addition to the five brands already represented) it this year began to represent AITO, a marque of Seres Group. Its strategic cooperation with Seres, a Chongqing-based leading

[10] *Data sourced from https://www.jardines.com/en/about-us/group-structure (accessed 31 August 2025).*

[11] *https://webfile.hkland.com/assets/sustainability-report/2025/en/hongkong-land-sustainability.pdf (p. 15).*

new energy vehicle automaker, marks a new departure for Zhongsheng, and one that aligns it with the 'sustainable AI' agenda discussed above.

In the consumer sector, Maxim's operates Shake Shack at the Chongqing MixC, a branch which was opened in June 2023.

Application of AI in Jardine Matheson Businesses

Like other global businesses, Jardine Matheson Group is actively engaging with the development, piloting and deployment of AI to position its businesses for the future. Jardines' portfolio is focused on services, and five examples can showcase the ways in which JM is applying AI to services and financial services businesses. Reflecting the Group's strategic posture, sustainability is a big driver, in particular in relation to climate and emissions. We believe our approach to AI contributes to the 'sustainable AI' agenda which was one outcome of this year's World AI Congress in Shanghai.

① *Jardine Matheson Corporate Office*

To capture the rapidly evolving digital landscape and transform ways of working with automation and digitalization, Jardine Matheson established Jardine Service Centre (JSC) in Foshan, China and Manila, Philippines. JSC has successfully deployed AI across various functions, including Finance, People & Culture and Technology[12]. Furthermore, a dedicated team has been formed to support Jardines' portfolio companies to adopt AI, ensuring consistent and scalable implementation across the Group. Most recently, JM introduced a chatbot portal that allows users to select large language models (LLM) from multiple vendors through a single interface, enabling activities such as document summarization, deep research and multi-media generation in a secure, cost-effective way.

At the corporate level, JM has partnered with TAU Intelligence to use a moderate-sized LLM for legal contract review and customer service. This LLM operates locally with a company environment, with input from JM staff. This strategic use of smaller and domain-specific LLMs helps to address some of the environmental and sustainability concerns posed by large LLMs, such as their high costs and environmental impact (popular LLMs consume 15 times more energy than a typical web search). In addition to resource efficiency, this collaboration deals with data security concerns by ensuring the security of proprietary data, as no data is used for training or retained by the LLM provider.[13]

② *Hongkong Land*

Hongkong Land has launched the Integrated Facility Management Control Tower (IFMCT), Hong Kong's

[12] *https://www.jardines.com/en/news-and-views/jardine-service-centre-advancing-operational-excellence-through-innovation-and*

[13] *https://www.jardines.com/en/news-and-views/tau-intelligence-collaborates-jardine-matheson-and-intel-pioneer-resource-efficient*

first AI-powered intelligent facility management platform ,[14] which consolidates over 20 systems into a single intelligence platform. This AI-powered predictive, proactive maintenance using AI health analytics, automates 66% of work orders, and reduces servicing frequency –such as cutting Air Handling Unit checks from monthly to biannual. It also optimizes energy use based on weather forecasts – helping to reduce energy consumption and accelerate decarbonization across the portfolio. Following successful pilots, IFMCT is being scaled across the Central Portfolio and regionally.

③ *DFI Retail*

A new partnership between DFI Retail and Dingdong Limited, signed in May 2025, will build a digitalised cross-border supply chain system to supply DFI retail supermarkets in Hong Kong. An AI prediction system will adjust inventory across these stores to reduce or minimise out of stock rates, and improve the efficiency of the fresh food supply chain. For example, the system can anticipate fluctuations in demand for vegetables based on weather changes and holidays in Hong Kong.[15]

④ *Mandarin Oriental*

Following a successful pilot in four hotels, Mandarin Oriental Hotel Group plans to install Winnow food waste technology across its 40 hotels by the end of 2025. This system helps to identify and track food waste, reducing the amount of waste and making cost savings. It is made up of a camera, smart-scale and tablet. Food waste is automatically identified by the camera as it is thrown away, and the system then calculates the weight and cost of the food discarded. This data is recorded on a daily basis, and information based on its analysis drives operational efficiencies and supports innovation in preparation, cooking and playing techniques. Overall, this contributes to sustainability, as food waste accounts for up to 10 percent of the world's greenhouse gas emissions. Typically, between 5 and 15 percent of the food kitchens purchase is wasted. The Group has a goal of reducing waste intensity by 50 percent by 2030, in line with targets under the United Nation Sustainable Development Goal 12.3.[16]

⑤ *Jardine Schindler*

Jardine Schindler has innovated through the use of built-in facial recognition and a revolutionary robotic installation system, Schindler RISE. This is the first system which enables a robot to execute installation steps automatically when elevators are installed in buildings. The company's facial recognition technology - BuilT-In Facial Recognition - has transformed monitoring and access control. The BuilT-In Facial Recognition won the AI - Industrial Engineering Award, and the BuilT-In Robot Service Connection won the Robotics - Industrial Engineering

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[14] *https://webfile.hkland.com/assets/press-release/2025/en/hll_20250821.pdf*

[15] *https://www.dfiretailgroup.com/media/2g0dtlgk/p250507.pdf*

[16] *https://photos.mandarinoriental.com/is/content/MandarinOriental/_DMO/_Corporate/PDFs/Press%20Releases/corporate-global-news-pdf-winnows-ai-technology.pdf*

Award in the 2021 Hong Kong Business Technology Excellence Awards.[17]

5.Conclusion and Recommendations

In conclusion, this meeting of the CMIA offers an excellent opportunity to bring together Chinese and international perspectives on the development of AI, and to consider what role Chongqing might play in its further development.

To facilitate this, we have the following recommendations:

- Strengthen external communication around the application of AI in Chongqing by local and international companies.
- Develop measures to improve further the business environment in Chongqing and facilitate investment in AI development, including pilot AI projects.
- Build strong connections from Chongqing to other centres of excellence in AI, both within China and overseas.
- Alongside the application of AI, continue work to deal with other economic and social challenges at a time of global political and economic flux.

[17] *https://www.jardineschindler.com/en/elevators/built-in/facial-recognition.html and https://www.jardineschindler.com/en/innovations/schindler-rise.html*

AI-powered Transformation and Upgrading of the Manufacturing Industry, Positioning Chongqing as a Hub of New Quality Productive Forces

Xia Quan
global VP of Qualcomm

Currently, artificial intelligence (AI) technology is transitioning from isolated breakthroughs to broad-based integration and application, increasingly becoming the core driver of global industrial transformation. The 2025 Government Work Report explicitly proposed "continuously promoting the AI Plus initiative," and recently, the State Council issued the "Opinions on Deepening the Implementation of the AI Plus Initiative", signaling that AI application development has entered a new phase of in-depth development. AI is not only at the forefront of technological innovation but also a key driver of industrial transformation. Qualcomm believes that hybrid AI architecture - where AI operates collaboratively across the cloud, edge, and terminal device - effectively balances the advantages of technical performance and implementation costs, gradually becoming a critical bridge connecting AI technology with practical industrial needs. Leveraging its deep expertise in "on-device AI + powerful computing + seamless connectivity," Qualcomm is providing robust technical support for key areas such as intelligent connected vehicles (ICV), intelligent robots, and the artificial intelligence of things (AIoT), helping to achieve more powerful, efficient, and highly optimized smart applications.

As a major national hub for manufacturing, Chongqing has been diligently implementing the key remarks and directives of General Secretary Xi Jinping during his inspection of Chongqing, with a focus on building a modern industrial system anchored in advanced manufacturing. It is imperative that Chongqing deepens the integration of manufacturing with AI and accelerates the creation of a new, modern Chongqing empowered by digital intelligence, supported by vibrant innovation ecosystems, and driven by advances in industrial intelligence. Seizing the strategic opportunities presented by AI and edge intelligence, and systematically advancing technological breakthroughs, expanding application scenarios, and fostering industrial ecosystem development, will be an essential pathway for Chongqing to achieve high-quality manufacturing growth and to establish itself as a leading center for new quality productive forces.

1. Analysis of Key Trends in AI Development

(1) The AI Industry Is Entering a New Cycle of Exponential Growth

From the perspective of technological transformation, continuous breakthroughs, and accelerated integration of frontier technologies such as foundational models, intelligent agents, and embodied intelligence are driving AI from perception and understanding toward decision-making and execution, profoundly reshaping the operational models and growth trajectories of various industries. The continuous breakthroughs in AI technology provide critical momentum for the AI industry to enter a new cycle of exponential growth. From the perspective of industrial transformation, AI is evolving from generative AI to multimodal AI agents and physical AI. The accelerated evolution of 5G-Advanced and 6G will spur large-scale connectivity scenarios such as passive IoT, satellite IoT, and 6G-based cellular IoT, while embodied intelligence and humanoid robots are taking center stage in technological development, in the process driving rapid growth in industrial base models, industry scale, and industrial investment. Relevant data indicates that the market size of AI intelligent agents is expected to grow from $5.1 billion in 2024 to $47.1 billion by 2030, with a compound annual growth rate (CAGR) of 44.8%. In 2024, the global AI market size reached $638.23 billion, projected to grow to $757.58 billion in 2025, and is expected to reach approximately $3.68047 trillion by 2034, with a CAGR of 19.20% from 2025 to 2034.[1] According to the "AI Development Report (2024)" by the China Academy of Information and Communications Technology, the global investment and funding for generative AI reached $25.2 billion in 2023, approximately nine times that of 2022. These figures reflect the remarkable momentum of the AI industry entering a new phase of exponential growth.

(2) Hybrid AI Architecture: Emerging as A New Option for Balancing Performance and Cost

From a technology architecture standpoint, while cloud-based AI computing currently dominates, as technology evolves and applications become more sophisticated, relying solely on the cloud can no longer meet the range of challenges posed by the explosive growth in computing demand — including cost, latency, privacy, and reliability. Hybrid AI, through a collaborative cloud–edge–device computing architecture, dynamically allocates workloads based on real-time demands, energy-efficiency requirements, and quality-of-experience standards, significantly enhancing system flexibility and cost-effectiveness. From an industry deployment perspective, this architecture can significantly reduce cloud computing and energy consumption costs, enabling stable operation of models with tens of billions of parameters in devices such as robots, vehicles, and IoT terminals. This enables high-performance inference while safeguarding user privacy and personalized experiences, providing a feasible new path for large-scale and commercial AI deployment. According to Tirias Research, shifting 20% of global generative AI workloads to on-device processing could save approximately $16 billion in computing resource costs by 2028.

[1] *The data is sourced from the "Artificial Intelligence (AI) Market Size, Share, and Trends 2025 to 2034" report published by Precedence Research in 2025*

(3) AI Development as a New Pathway for a Comprehensive Leap in Productivity

From an industry integration standpoint, AI technologies and solutions have been fully integrated into key sectors such as media, healthcare, robotics, and manufacturing. They not only significantly drive cost reductions and efficiency gains through innovative products, services, and restructured production processes but also continuously feed back into model optimization and system evolution through real-world industry data, achieving the leap from single-point solutions to ecosystem-level restructuring. From an economic impact perspective, AI is becoming a core variable in reshaping global productivity. IDC predicts that AI applications in the automotive industry will expand at a CAGR of 46%, and McKinsey further forecasts that the AI industry could contribute $2.6 trillion to $4.4 trillion annually to the economy in the coming years. Accelerating AI adoption has shifted from being a matter of choice to a must-answer question critical to the future, serving as a key driver for a revolution in production efficiency and substantial value creation.

2. Analysis of the Urgent Need for Quality and Efficiency Improvements in Chongqing's Key Industries

(1) Industrial Robots: A Key Breakthrough for Advancing Manufacturing Intelligence

As a major national manufacturing hub, Chongqing is accelerating its transition from traditional manufacturing to smart manufacturing. In this process, industrial robots are a key sector and strategic linchpin for advancing manufacturing intelligence. Robots are not only advanced equipment themselves, but also multifunctional platforms integrating multiple technologies such as AI, big data, and automation control, playing a decisive role in improving production efficiency, ensuring product quality, and promoting industrial upgrading.

In recent years, Chongqing has gradually formed a complete industrial chain encompassing R&D, full-unit manufacturing, systems integration, component manufacturing, and talent cultivation, becoming one of the nation's key robot production bases. The robotics industry is one of the 18 emerging industrial clusters within Chongqing's "33618" modern manufacturing cluster system. By the end of 2024, Chongqing had gathered over 300 key robotics companies, including Huashu, Qiteng, Kawasaki, and FANUC, with annual robot production exceeding 60,000 units and the total output value of the entire industrial chain surpassing 37 billion yuan. The industry's output scale continues to expand, showing promising application prospects in fields such as automotive manufacturing, component processing, and intelligent logistics. The Jialing River Laboratory, led by Chongqing University, is also exploring frontier research such as embodied intelligence, further strengthening Chongqing's R&D foundation in the robotics industry.

However, from the standpoint of overall manufacturing upgrading, Chongqing's robotics industry still has substantial growth potential. On the one hand, current applications are primarily concentrated in structured, highly repetitive single-task execution scenarios such as automotive welding and electronic assembly, with limited cov-

erage of intelligent capabilities in unstructured, complex, and dynamic environments. On the other hand, existing robots still require breakthroughs in multimodal perception, autonomous cognitive decision-making, and intelligent planning, and execution. In particular, in flexible production lines, complex assembly processes, and high-end manufacturing fields, industrial robots have not yet fully replaced human labor, and their intelligence level still has considerable room for improvement. For example, the success rate of dexterous robotic hands grasping irregular objects remains below 70%, and the collaborative efficiency of robots on flexible production lines is only 65% of that of human workers. Industrial robots are not only tools for industrial upgrading but also an important embodiment of New Quality Productive Forces. Accelerating the deep integration of robots in manufacturing will secure new advantages for Chongqing in manufacturing intelligence and provide a replicable and scalable "Chongqing model" for national manufacturing transformation. Therefore, Chongqing urgently needs to seize the opportunities presented by the advancement and application of robotics technologies — on the one hand, achieving breakthroughs in key technologies such as high-precision multimodal sensor fusion, real-time cognition and decision-making in complex scenarios, and high-dynamic, adaptive, and precise control; and on the other hand, accelerating industry-wide and multi-scenario adoption of industrial robots to provide stronger support for the upgrading of manufacturing intelligence in Chongqing.

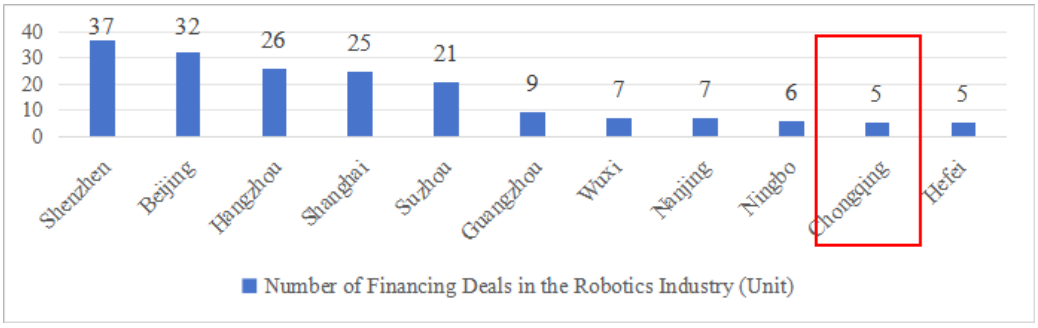


Figure 1: Industrial Robot Installation Volume

Data Source: Embodied Intelligence Industry Development Research Report

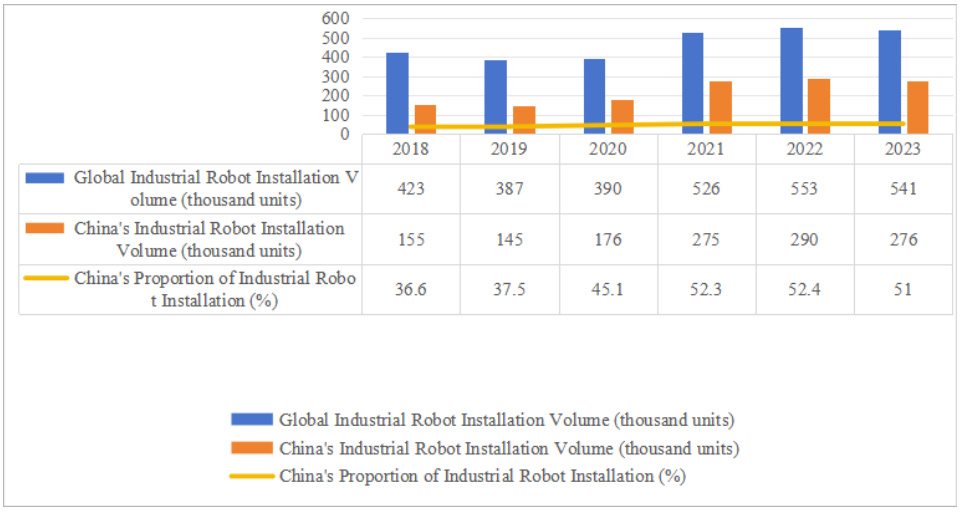
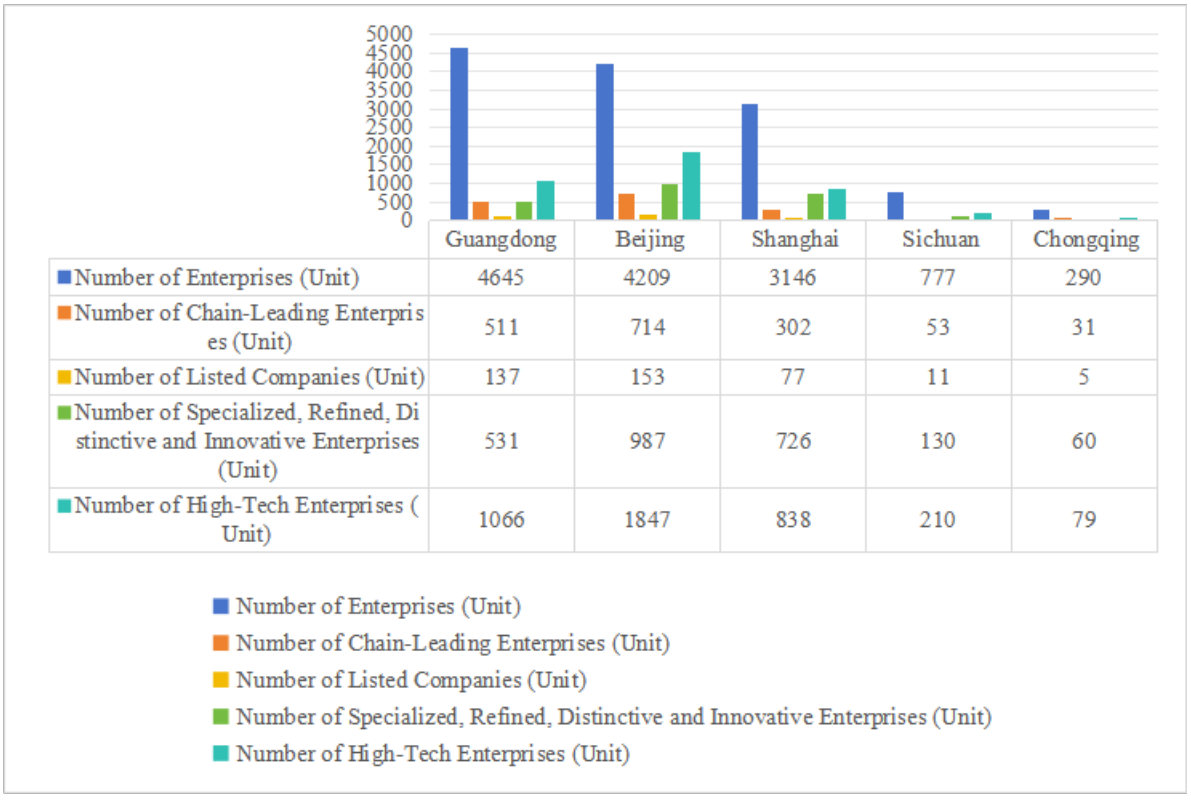


Figure 2: Number of Robotics Industry Financings in Various Cities in 2024

Data Source: 2024 China Robotics Industry Annual Report



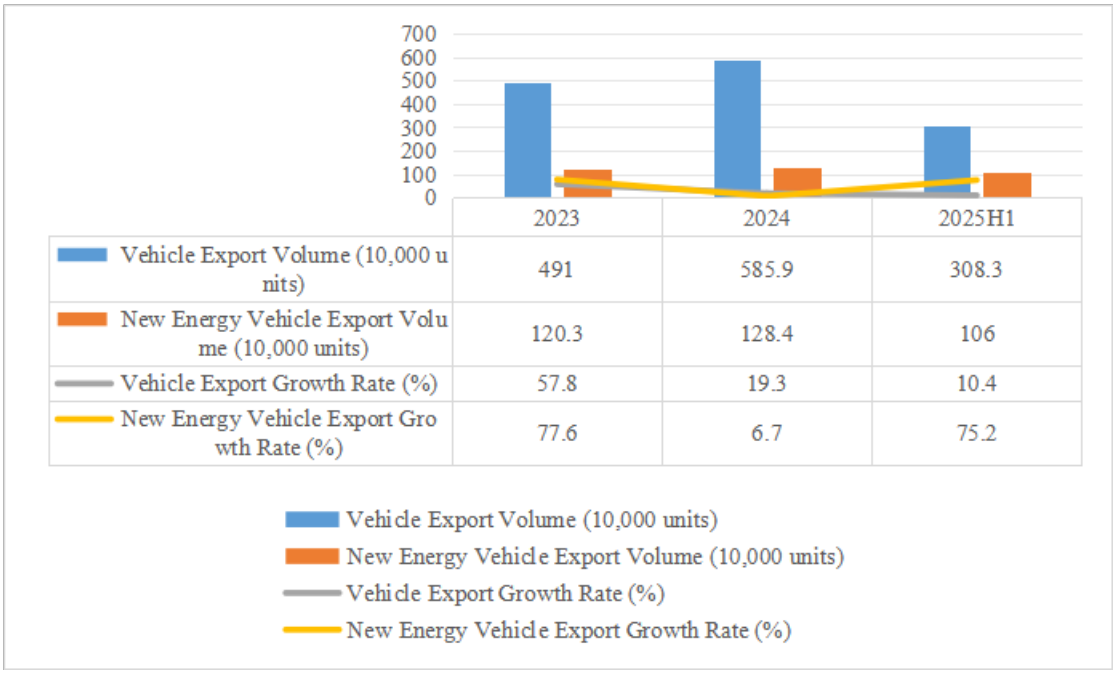
	Guangdong	Beijing	Shanghai	Sichuan	Chongqing
Number of Enterprises (Unit)	4645	4209	3146	777	290
Number of Chain-Leading Enterprises (Unit)	511	714	302	53	31
Number of Listed Companies (Unit)	137	153	77	11	5
Number of Specialized, Refined, Distinctive and Innovative Enterprises (Unit)	531	987	726	130	60
Number of High-Tech Enterprises (Unit)	1066	1847	838	210	79

Figure 3: Number of Key Humanoid Robot Companies (as of January 2025)

Data Source: China Embodied Intelligence Development Report

(2) ICV: Accelerating the Shift to "Intelligent Terminals" Requires the Urgent Promotion of Generative AI in vehicles

ICV are not only means of transportation but are also evolving into super intelligent terminals integrating perception, computing, and interaction. As the electrification process accelerates, the competitive focus of the automotive industry is gradually shifting toward intelligence and software-defined vehicles. Chongqing is accelerating the construction of a world-class intelligent connected new energy vehicle industry cluster, targeting a scale of one trillion yuan, and has established a closed-loop value chain covering materials, components, complete vehicles, and services. Its automotive production accounts for 8.1% of the national total, and vehicle exports account for 7.4% of the national total, demonstrating a strong industrial foundation and robust growth momentum. However, in terms of intelligent development, the industry still faces several common challenges: first, the vehicles-side computing power and software architecture require further upgrades to support more complex application requirements; second, the large-scale application of generative AI in vehicles is still in its early stages, falling short of user expectations for more natural human-machine interaction and smarter driving experiences; third, further integration of local innovation with international markets is needed to showcase stronger technological advantages on the global stage.



	2023	2024	2025H1
Vehicle Export Volume (10,000 units)	491	585.9	308.3
New Energy Vehicle Export Volume (10,000 units)	120.3	128.4	106
Vehicle Export Growth Rate (%)	57.8	19.3	10.4
New Energy Vehicle Export Growth Rate (%)	77.6	6.7	75.2

Figure 4: China's Vehicle Export Data

Data Source: China Association of Automobile Manufacturers

ICV as a core breakthrough for AI empowerment and promoting the deployment of large generative AI models in vehicles are critical tasks for the next stage. On one hand, large-scale models should be used to enhance the voice recognition and comprehension, contextual awareness, and personalized service capabilities of intelligent cockpits, creating immersive interactive experiences. On the other hand, the deployment of generative AI in areas such as driver assistance systems should be promoted to enhance vehicles' autonomous perception and decision-making capabilities in complex scenarios. By accelerating the integration of AI into vehicles, Chongqing's intelligent connected vehicle industry can achieve a significant upgrade in industrial development and enhance the global competitiveness of Chongqing-made vehicles.

（3）The Internet of Things (IoT): Shifting from Device Connectivity to Supporting "Edge-Cloud" Distributed Intelligence, Becoming a Key Enabler for Intelligent Manufacturing

In the process of promoting the intelligent upgrade of manufacturing, the Internet of Things (IoT) has evolved beyond simply "connecting devices" Instead, through deep integration with AI, edge computing, and cloud collaboration, IoT is gradually evolving into a critical infrastructure supporting the digital transformation of industries. With the accelerated implementation of applications such as smart cities, smart transportation, and smart factories, IoT is transitioning from "connecting everything" to "intelligently connecting everything," demonstrating its increasingly important role in improving manufacturing quality and efficiency.

Leveraging its solid industrial foundation, favorable policy environment, and vast market space, Chongqing

has become one of the key regions for IoT industry development. The number of IoT terminal users in Chongqing has already exceeded 50 million, with the scale of IoT connections reaching new heights. Building on this foundation, Chongqing has the conditions to position IoT as a key fulcrum for promoting the digitalization and intelligence of manufacturing in the new round of industrial upgrading.

From a manufacturing perspective, the model of relying solely on "device connectivity + data collection" can no longer meet the real-time response and precise control demands of high-end manufacturing and smart factories. Over 80% of edge devices lack local computing capabilities, and the massive data transmission to the cloud results in significant bandwidth pressure and high latency. To fully realize the value of IoT, it is necessary to accelerate the formation of a distributed intelligent system featuring "edge real-time processing + cloud global intelligence," enabling devices not only to perceive and collect data but also to perform real-time analysis and decision-making.

Therefore, accelerating the upgrade of IoT to Artificial Intelligence of Things (AIoT) is not only a vital choice for promoting the high-quality development of Chongqing's manufacturing industry but also an important direction for building new digital infrastructure and enhancing the modernization level of urban governance. By achieving breakthroughs in key areas such as industrial manufacturing, transportation logistics, and urban governance, Chongqing has the potential to position IoT as a key engine for manufacturing intelligence upgrading and the leap in new quality productive forces.

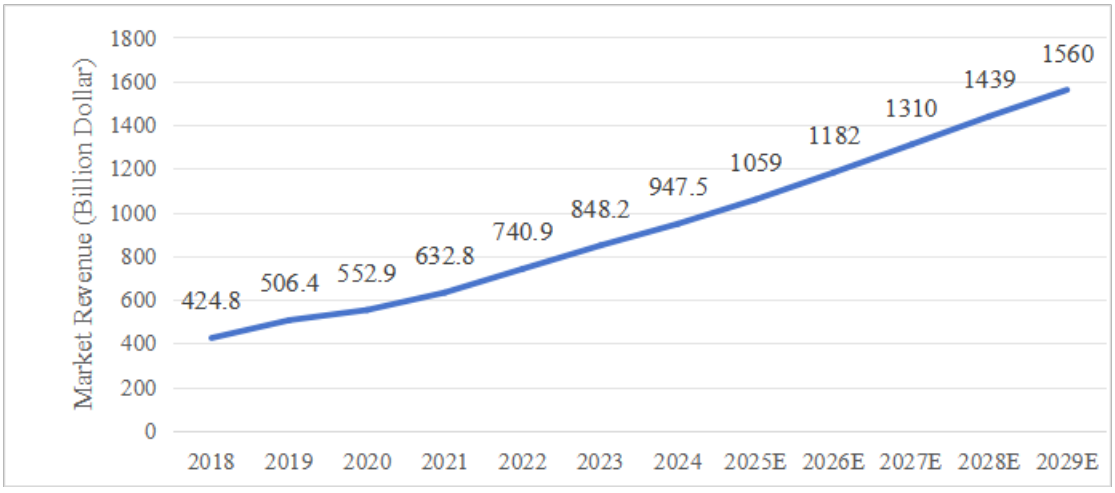


Figure 5: Global IoT Market Revenue

Data Source: Statista, Chongqing IoT Industry Association

3. Recommendations for Accelerating the Formation of New Quality Productive Forces with AI as the Core Engine

Intelligent robots, ICV, and AIoT are key enablers for upgrading manufacturing intelligence capabilities. Building on Chongqing's industrial foundation and development goals, a three-in-one approach of technological

breakthroughs, ecosystem building, and application demonstrations should be adopted to accelerate AI-empowered industrial transformation. This will propel Chongqing to take the lead in building a national benchmark city for intelligent manufacturing. In the new era, Chongqing must prioritize technological breakthroughs, support ecosystem development, and leverage application pilots to fully establish a new AI-empowered paradigm characterized by innovation leadership, openness, and inclusivity, radiating influence, and win-win cooperation. This will inject new momentum into Chongqing's manufacturing industry's journey toward high-end, intelligent, and green development. Qualcomm is committed to leveraging its technological advantages in AI, computing, and connectivity to work with Chongqing to build a new quality productive system with AI at its core.

（1）Taking Industrial Robots as a Breakthrough to Build a New Engine for Intelligent Upgrading of the Manufacturing Industry

Industrial robots are an important platform for promoting quality and efficiency improvements in manufacturing. Chongqing should leverage its existing industrial cluster advantages and prioritize robots as a direction for intelligent manufacturing upgrading. It is recommended that Chongqing:

- Strengthen technological innovation. Continue innovating in key areas such as high-precision perception, multimodal fusion, intelligent decision-making, and collaborative control to support robots in becoming more flexible, intelligent, and collaborative. Qualcomm's RB series and industrial-grade IQ series platforms have advantages in computing power, energy efficiency, connectivity, and AI acceleration, providing "end-to-end" technical support for Chongqing's robotics companies. Qualcomm's new industrial-grade IQ series chipsets excel in terms of computing power, energy efficiency, connectivity, and AI acceleration, effectively meeting the demands of traditional robots for low power consumption, low latency, and high computing capabilities.

- Build high-level benchmark products and demonstration applications. In line with Chongqing's specific needs in the automotive, electronics, and equipment manufacturing industries to accelerate the implementation of typical "Robot+" applications, such as flexible automotive assembly, hazardous material inspection, and production line collaboration, promoting the transition of robotics from localized applications to full-scale, multi-scenario coverage.

- Foster a collaborative innovation ecosystem for the industry. Introduce international partners to promote collaborative innovation among local whole-unit manufacturers, component suppliers, and software developers, forming a "robotics industry hub" with national influence.

(2) Focusing on ICV to Accelerate the Deployment of Generative AI in Vehicles

ICV are a key enabler for intelligent upgrading of the manufacturing industry and a crucial scenario for the initial deployment of generative AI large-scale models. Qualcomm's Snapdragon Digital Chassis solutions (including the Snapdragon Cockpit Platform, Snapdragon Ride Platform, The Snapdragon Auto Connectivity Platform,

and Car-to-Cloud Services) have provided critical technical support for numerous leading automakers globally and in China, including Mercedes-Benz, BMW, Li Auto, Zeekr, NIO, and Leapmotor.

Chongqing has a solid foundation in the ICV industry. Changan Automobile, a local leading enterprise, has collaborated with Qualcomm in multiple fields. Based on this, it is recommended that Chongqing:

- Strengthen local collaboration. Support Changan and other automakers to deepen cooperation with Qualcomm in areas such as AI-empowered intelligent cockpits and driver assistance, in turn creating a "Chongqing model" for ICV.

- Promote the deployment of large-scale models in vehicles. Apply generative AI in intelligent cockpits to enhance voice understanding, contextual awareness, and personalized service capabilities. Qualcomm's Snapdragon Digital Chassis solutions are enabling several leading Chinese automakers to deploy vehicle-side large AI model functions in intelligent cockpits, providing a proven path for Chongqing to follow.

- Promote the "Chongqing ICV Going Global" plan. Leverage Qualcomm's global platform and rich experience, to help Chongqing automakers seize opportunities in overseas markets and establish differentiated advantages in product intelligence and service upgrades. By developing models with cutting-edge features such as vehicle-side large-scale models, intelligent cockpits, and driver assistance, "Chongqing vehicles" will become more competitive on the global stage and become an important showcase for Chongqing's intelligent manufacturing capabilities.

(3) Build a "Cloud-Edge-Device" AIoT System to Consolidate the Foundation of Industrial Digitalization

IoT is a core infrastructure supporting the intelligent transformation of manufacturing and society. Chongqing should fully leverage its industrial and market advantages to accelerate the construction of an AIoT system characterized by edge intelligence and cloud collaboration. This will not only serve as a key driver for improving manufacturing quality and efficiency but also as a foundation for innovative applications in retail, transportation, urban governance, and other fields. Drawing on Qualcomm's global experience in AIoT, the following recommendations are proposed to accelerate AIoT development from "quantitative growth" to "a qualitative leap forward":

- Strengthen the new AIoT information infrastructure. Leveraging leading connectivity, energy efficient computing, and edge AI technologies, support the embedding of lightweight AI modules in terminal devices and actively promote the R&D, scenario testing, and deployment of AIoT devices for typical scenarios such as industrial manufacturing and urban governance. This will build an integrated intelligent foundation of "cloud-edge-device" collaboration, empowering the development of a "Digital Chongqing" and the modernized governance of megacities.

- Strengthen AIoT industry ecosystem cultivation. Promote in-depth collaboration among upstream and

downstream enterprises in the AIoT industry chain, introduce leading international innovation resources and key technologies, iteratively upgrade industrial and consumer IoT products, support local outstanding AIoT solutions, products, and services to "go global," build an open, cooperative, secure, and efficient AIoT ecosystem, and accelerate the realization of two-way empowerment of the IoT industry and Chongqing's "Starry Sky" action plan (2022-2025) (to boost its software and information services industry) and related industries.

Chongqing is at a critical stage of transformation and upgrading in its manufacturing industry. By seizing the strategic opportunities in the three key areas of industrial robots, ICV, and AIoT, Chongqing has the potential to establish a leading position in the intelligent upgrading of the manufacturing industry. Qualcomm will continue to leverage its global technological capabilities in AI, computing, and connectivity to collaborate with Chongqing in order to build a future-oriented hub for new quality productive forces, in turn contributing the "Chongqing Experience" to the national manufacturing transformation.

Empowering the Future with AI - Together Shaping a New Chapter for Chongqing in AI + Advanced Manufacturing

Brendan M. Mosher
International Vice President and General Manager, Corning Display Technologies

Abstract

As the core hub of manufacturing in western China, Chongqing holds a significant position in the nation's economic blueprint, leveraging its rich resource endowment and vast market potential. Manufacturing serves as the cornerstone of Chongqing's economic development. During the 14th Five-Year Plan period, Chongqing's manufacturing sector achieved remarkable progress, with its industrial added value and large-scale industrial added value ranking among the top nationwide. Industry clusters such as automobiles, electronics and information, and display technology have demonstrated outstanding performance.

As the dominant force of the real economy, manufacturing forms the foundation of Chongqing's city-building efforts and its economic strength. The central government places great emphasis on the development of Chongqing's manufacturing sector, explicitly prioritizing its high-quality growth and striving to establish Chongqing as a key advanced manufacturing center in the country. To this end, Chongqing has actively promoted the "33618" modern manufacturing cluster system, setting clear goals for the high-end and intelligent development of its manufacturing sector.

At the same time, artificial intelligence (AI) is profoundly transforming the industrial sector and has become a critical driving force for the global industrial transformation - through innovation, efficiency improvement, and cost reduction in manufacturing industries. With the continued advancement and widespread application of AI technologies, an increasing number of industrial enterprises are exploring the implementation of large industrial models and intelligent agents in manufacturing scenarios.

Corning, an almost 175 years old traditional manufacturing enterprise, has also embraced AI, optimizing production processes through its "Manufacturing 4.0" strategy to create intelligent and efficient lean production facilities. This has resulted in benefits in both economic returns and efficiency gains. Looking forward, the deep integration of AI and manufacturing is destined to become the essential path for Chongqing to build advanced manufacturing clusters.

However, the current development of AI is highly fragmented, as different sectors (and companies) are work-

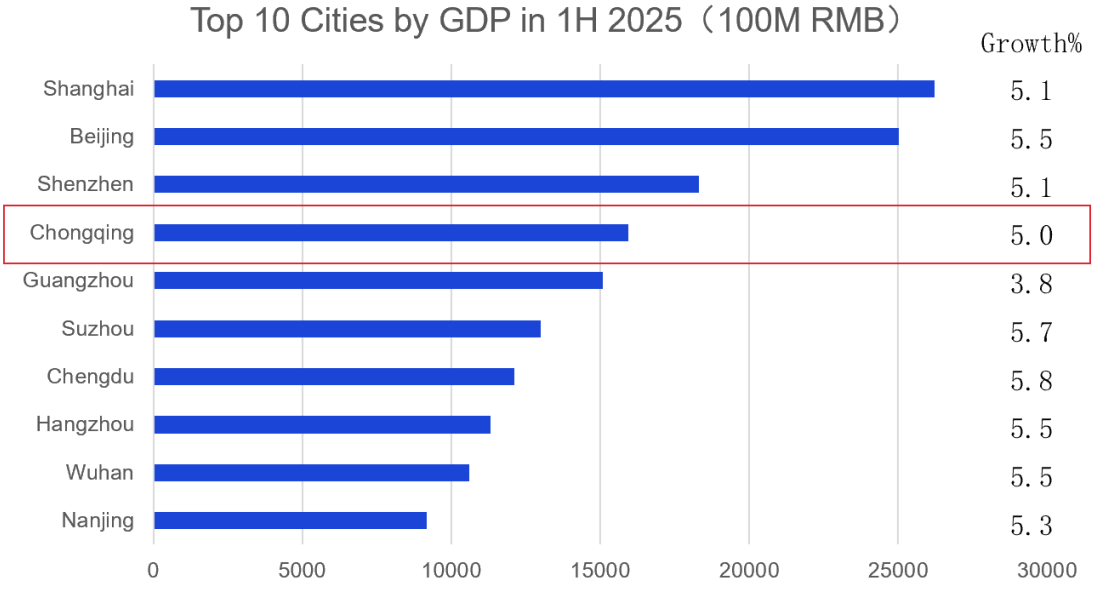
ing independently and lacking synergy. To drive systemic progression, it is imperative for the government to play a guiding role by integrating resources and establishing a unified platform to provide clear direction and robust support for enterprises in their AI development journey.

We recommend that Chongqing further leverage its role as a model city for innovation by driving breakthroughs in core technologies and their commercialization, building a talent pool of high-end AI professionals, improving the supporting system for AI implementation, and continuously attracting world-class enterprises to invest and establish a presence in the city. These efforts will help accelerate the high-end and intelligent transformation of its manufacturing sector, significantly enhancing the industrial value chain. In the field of smart manufacturing, Chongqing should actively learn from international and domestic best practices and promote successful models across the region, benefiting more enterprises and substantially improving efficiency and competitiveness, thereby solidifying its leading position in the manufacturing sector.

1.Current Status of Chongqing's Manufacturing Sector and Industrial Clusters1.1

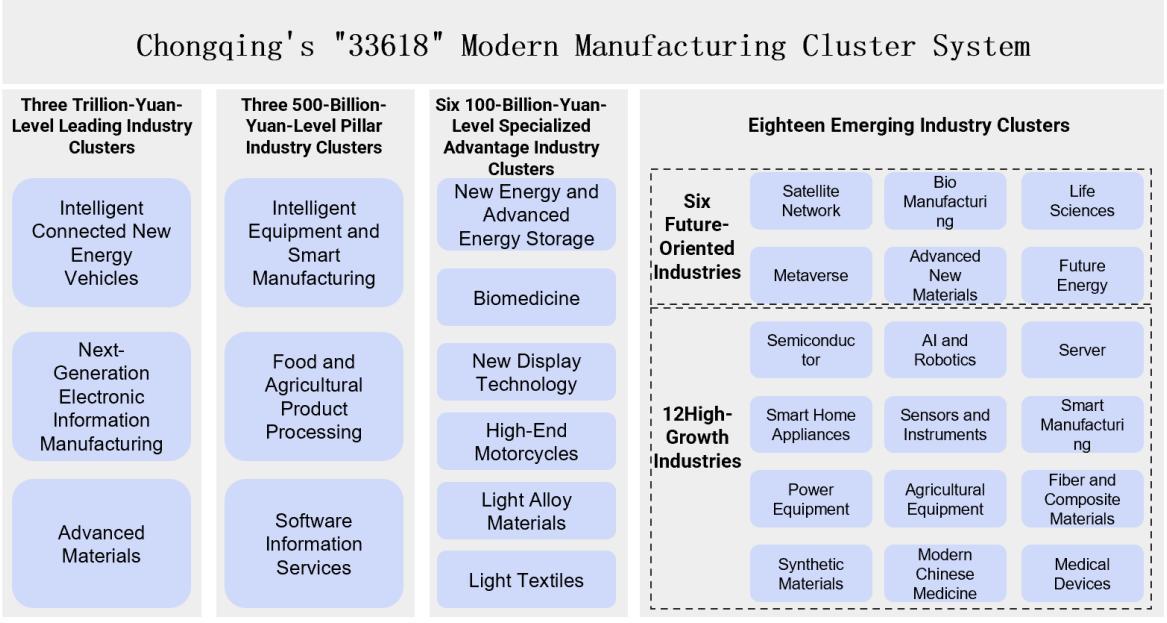
1.1 Chongqing's Manufacturing Foundation

- As the manufacturing center of western China, Chongqing boasts not only abundant resources but also extensive market potential. Manufacturing plays an irreplaceable and central role in Chongqing's economic development. Since the beginning of the 14th Five-Year Plan period, Chongqing's manufacturing sector has achieved significant progress and results. In just the first half of 2025, Chongqing's total GDP reached almost 1.6 trillion yuan, representing a year-on-year growth of 5.0%. Both in terms of economic scale and growth rate, Chongqing ranked fourth among cities nationwide in China, showcasing the robust development momentum of its manufacturing industry.



- In terms of industrial system development, Chongqing has fully leveraged its foundational and unique advantages to meticulously build the “33618” modern manufacturing cluster system. This system focuses on three trillion-yuan-level leading industry clusters: smart & connected electric vehicles, next-generation electronics manufacturing, and advanced materials. Additionally, it thrives to upgrade three 500-billion-yuan-level pillar industry clusters: smart equipment and smart manufacturing, food and agricultural product processing, and software & information services. Furthermore, Chongqing has cultivated six 100-billion-yuan-level special advantage industry clusters, including new display technology, high-end motorcycles, light alloy materials, light textiles, biomedicine, and new energy and advanced energy storage.

- By emphasizing future industries and high-growth industries, Chongqing has established 18 emerging industry clusters. This system not only optimizes the city’s industrial structure but also significantly enhances inter-industry synergy, boosting the overall competitiveness of Chongqing’s manufacturing sector.



- Chongqing places great importance on the role of research and innovation in supporting manufacturing development and has consistently increased investment in this area:

  - From 2018 to 2024, Chongqing maintained a policy of “Keep Growing” fiscal investment in science and technology, with cumulative funding reaching 63 billion yuan and an average annual growth rate of 11.5%. This rate far surpasses the 7.9% growth of generic public budget expenditures, greatly stimulating innovation across the city.

  - In 2024, Chongqing focused on key areas such as digital & smart technology, new materials, life sciences, and green/low-carbon energy. The city approved and supported 152 major science and

technology research projects, with fiscal investment exceeding 600 million yuan, which in turn attracted more than 2.1 billion yuan in private investment.

1.2 Chongqing's Vision for Industrial and AI-Enabled Development

- Chongqing has established clear goals and plans to advance the high-quality integration of artificial intelligence (AI) with manufacturing. According to the "Chongqing Action Plan for AI-Enabled High-Quality Development of Manufacturing (2025-2027 Draft)" released in 2025, the city aims to accelerate the development of intelligent operating systems with independent intellectual property rights, such as smart vehicle operating systems and industrial control operating systems. Leveraging its role as a national pilot city for "vehicle-road-cloud integration" in smart & connected vehicles, Chongqing will focus on key breakthroughs in areas such as "vehicle-road-cloud-internet" collaboration, multi-sensor fusion perception, and high-dynamic intelligent execution, further enhancing its technological innovation capabilities.

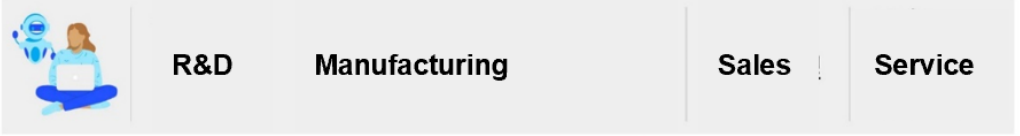
- Through these efforts, Chongqing aspires to establish itself as a nationally influential hub for AI industry development and applications. The city aims to achieve significant outcomes in leveraging AI to enable the high-quality development of its manufacturing sector.

2. The Critical Role of Artificial Intelligence in Manufacturing and Case Studies

2.1 AI's Crucial Role in Upgrading Manufacturing and Its Broad Applications in Companies

- Artificial intelligence (AI) is profoundly transforming the industrial sector, driving the transformation and upgrade of manufacturing through advanced technologies that enhance efficiency and reduce costs. In recent years, with continuous advancements and deeper applications of AI technologies, an increasing number of industrial enterprises have begun exploring the practical implementation of large industrial models and intelligent agents in manufacturing scenarios.

- Numerous leading enterprises across various industries are intensifying their efforts in the "industrial + AI" space. From research and design to production and manufacturing, and even to operations management, the application scenarios for intelligent solutions are becoming increasingly diverse, showcasing immense potential.



  - Lenovo's Intelligent Agent Applications (Covering the Entire Supply Chain) Lenovo launched

an intelligent agent tailored for the manufacturing sector, combining AI technology with deep industry expertise. This solution spans key scenarios, including research and design, production optimization, supply chain collaboration, and customer service, achieving data-driven closed loops and intelligent decision-making. Supported by the "Supply Chain Intelligent Control Tower" intelligent agent, Lenovo's global supply chain achieved end-to-end coverage across the entire value chain. This has effectively reduced decision-making time by 50%-60%, improved operational efficiency by 10%-20%, enhanced on-time delivery rates by 5%, and cut manufacturing and logistics costs by 20%.

◦ Amazon's AI System Applications (Sales)

Amazon has leveraged artificial intelligence to enhance its demand forecasting and delivery route planning capabilities.

AI-assisted route planning ensures inventory management incorporates time-sensitive data, such as weather conditions, and helps drivers more easily locate delivery destinations.

AI-powered demand forecasting uses extensive data to improve accuracy, including regional differences—such as heightened demand for ski goggles during the skiing season in Boulder, Colorado. These forecasts have improved the accuracy of nationwide promotional campaigns by 10% and increased regional predictions for popular products by 20%.

◦ General Motors' AI System Applications (Production)

General Motors has integrated AI tools into its production processes to enhance quality control, assist with factory equipment inspections, and ensure fault-free vehicle software functionality.

GM employs centralized testing and validation processes to guarantee that software functions correctly during new vehicle launches, eliminating potential code errors. At its Global Technical Center in Warren, Michigan, GM has established 300 testing stations, managed by just eight engineers, with AI software ensuring continuous, round-the-clock operation. Automated tools identify issues at 10 times the rate of manual inspections.

Additionally, GM uses cameras, sensors, and analytical tools to monitor manufacturing equipment. This system collects 165 million images daily and can predict equipment failures before they disrupt vehicle production, significantly improving factory uptime and operational efficiency.

◦ China Telecom's Xingchen MaaS Platform Application Case in the Textile Industry (Production)

The Xingchen MaaS platform is an AI enabling platform independently developed by China Telecom. It is designed with a comprehensive, user-friendly, and high-performance approach, creat-

ing a customer-centric, full-featured service platform for large models. It can meet user needs for multi-cloud computing resource scheduling, data annotation and processing, large model training and inference, as well as industry-specific intelligent applications all in one place.

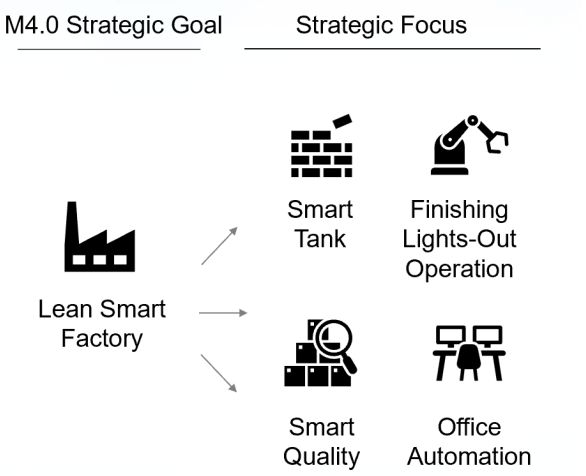
The "Xingchen Textile Intelligent Agent," developed based on the MaaS platform, has achieved remarkable results in intelligent regulation of process parameters and real-time fabric quality inspection during weaving. This system has achieved a 99% on-time delivery rate, a 20% increase in production efficiency, and a long-defect detection rate exceeding 99%. These outstanding results fully demonstrate its leading position in the field of industrial AI.

- With the widespread adoption of AI technologies, the proportion of industrial enterprises utilizing intelligent agents has increased significantly. According to IDC's 2025 survey of Chinese industrial companies, the adoption rate of large models and intelligent agents grew from 9.6% in 2024 to 47.5% in 2025. Among these, the proportion of enterprises with extensive applications across multiple operational areas jumped from 1.7% to 35%, demonstrating the rapid proliferation of industrial intelligent agents and their promising future.

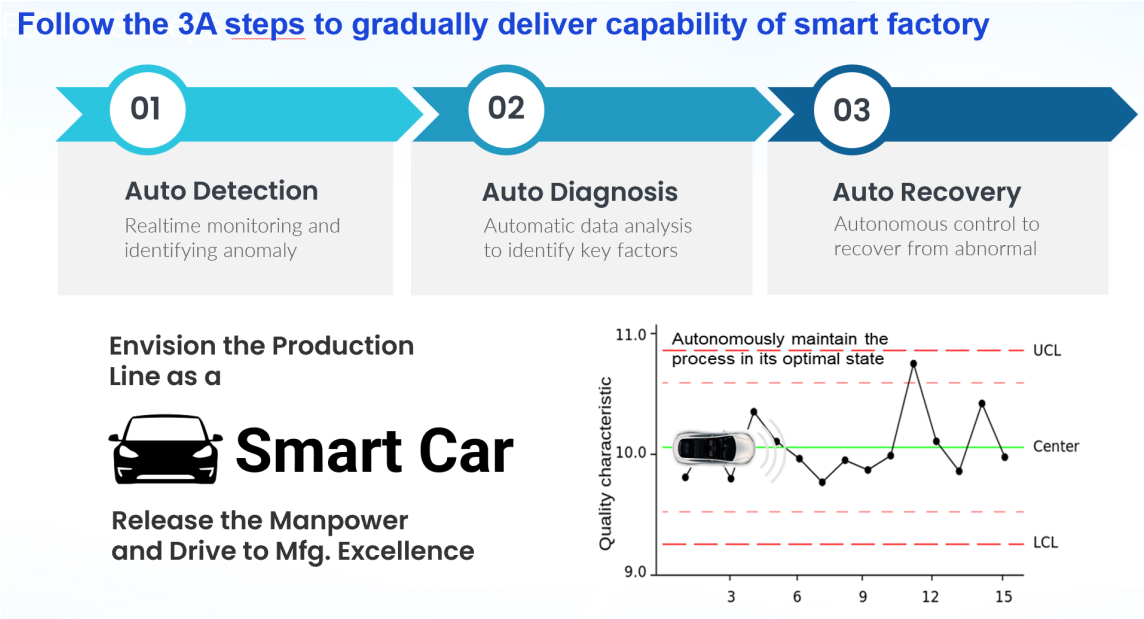
2.2 Corning's Strategies and Case Studies in AI Applications

- Corning's application of artificial intelligence spans the entire supply chain, including production, research and development, logistics, business management, finance, and even legal and intellectual property management. Through years of proactive efforts, Corning has implemented digital transformation initiatives in multiple production facilities, including its Chongqing base, and has achieved promising initial results.

- Corning's "Manufacturing 4.0" strategy uses AI as an accelerator to establish intelligent and efficient lean manufacturing plants. The scope of the initiative includes smart furnaces, intelligent downstream processes, smart quality inspection, and office automation.



- Corning employs a 3A model (auto detection, auto diagnosis, auto recovery) to build intelligent and efficient factories. This model allows production lines to function like autonomous vehicles, performing real-time automatic detection, independently analyzing critical issues, and automatically restoring operations to normal conditions.



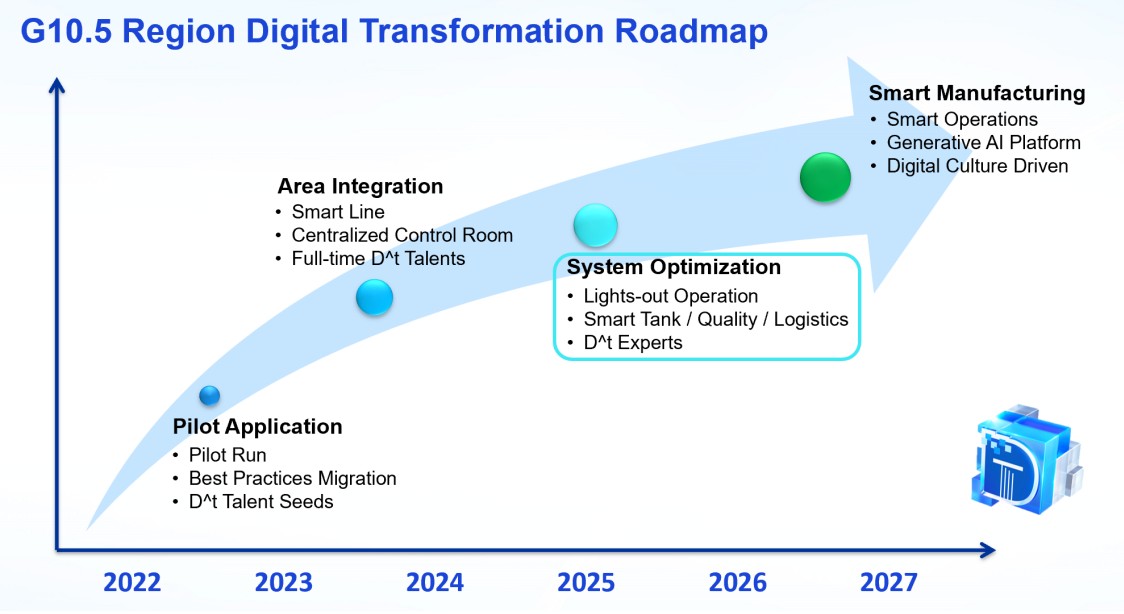
- In a specific case, Corning's Chongqing facility actively responded to global energy-saving and sustainability initiatives, as well as China's 30-60 carbon neutrality goals, by developing an intelligent optimization system for cooling water circulation. This system not only conserved energy but also improved the overall utilization efficiency of the cooling water system. Additionally, the Chongqing team developed and deployed an energy and carbon management platform, enabling real-time monitoring of the company's energy usage. Through big data analysis, the platform provides detailed energy consumption reports and optimization suggestions, helping enterprises adjust energy usage strategies in a timely manner while gaining insights into their carbon emissions.

- Furthermore, the platform is equipped with advanced alarm and early warning systems, which promptly issue alerts in cases of abnormal energy usage or excessive carbon emissions. This allows enterprises to take immediate countermeasures, preventing energy waste and environmental pollution, and ensuring the sustainable use of energy.

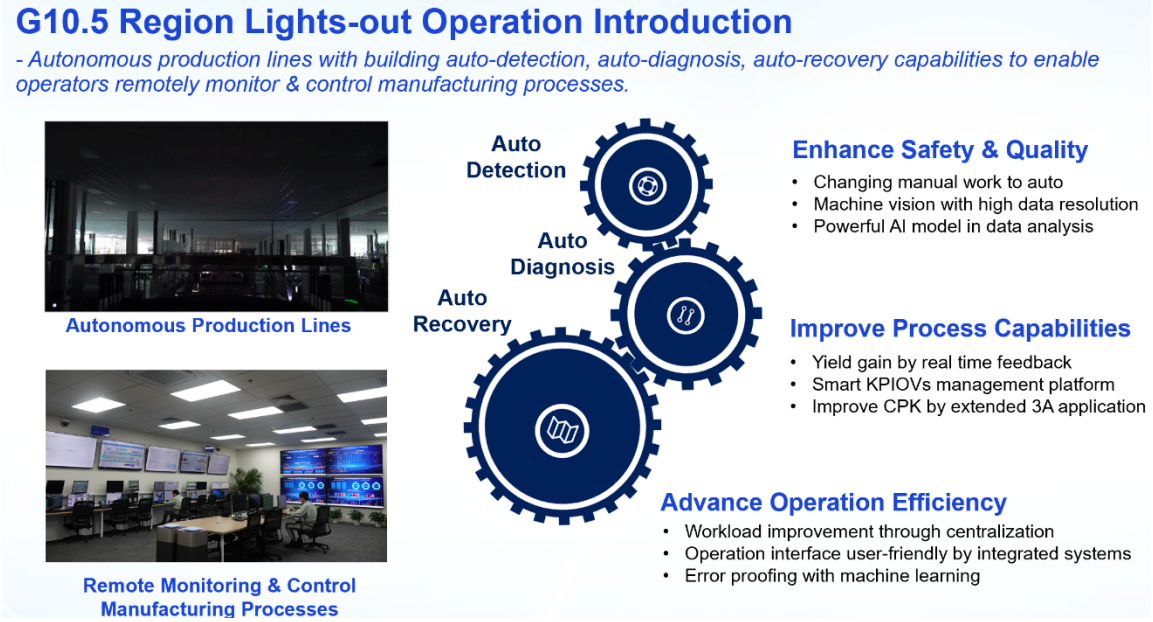
- This initiative has enabled the Chongqing factory to achieve an annual reduction of approximately 8% in energy consumption and an improvement of about 4.8% in its energy efficiency ratio (CoP).

- Additionally, the case of Corning's 10.5-generation display glass substrate production factory exemplifies the company's concrete actions in establishing intelligent and efficient factories.

◦ In 2022, Corning's Display Technologies division launched a five-year vision plan aimed at the digital transformation of its 10.5-generation glass production line. The plan focuses on regional integration and system optimization, with the ultimate goal of achieving a smart and efficient factory transformation for the 10.5-generation production line by 2027.



◦ In 2025, the focus was on optimizing the downstream processes of the 10.5-generation production line. The project involved building a capability platform for automated problem identification, diagnosis, and resolution, enabling remote monitoring and control. This ultimately resulted in a fully automated production line. This transformation enhanced production safety and quality control, improved process output rates, and significantly increased production efficiency.



- Through the transformation brought about by this project, Corning's 10.5-generation factory has achieved a high level of efficiency and intelligence. Cameras have replaced human eyes, and computer programming has replaced manual efforts to identify and diagnose anomalies, making the factory significantly smarter and more efficient. Tasks that previously relied on manual re-inspection, prone to oversight, are now performed by robotic arms combined with cameras, enabling precise data collection. Adjustments that were once made manually by interpreting waveform graphs are now handled by AI models capable of self-correction.

- Processes such as manually driving forklifts to transport products have been replaced by autonomous vehicles performing automated transportation, reducing labor safety risk. The factory transitioned from reactive responses to equipment downtime to visualized equipment monitoring with automated early warnings. Time-consuming and labor-intensive manual data analysis to detect temperature anomalies has been replaced by real-time, visualized temperature monitoring. Inspections of furnaces under high temperatures are now conducted remotely using infrared cameras. From the back-end to the front-end, and from manual operations to intelligent systems, the factory has undergone a qualitative leap in efficiency.

- As of now, the project has achieved significant milestones: production lines operate seamlessly, machines run in an orderly and automated manner. Additionally, a smart control center has been established, where employees have transitioned from being repetitive task executors to becoming operators of intelligent systems. This has enabled efficient collaboration between humans and AI, achieving a harmonious integration of intelligence and productivity.

- Since its implementation, the project has helped Corning's 10.5-generation glass production line achieve significant improvements in efficiency, cost reductions, and energy savings.

    - Cost Savings in 2025 and beyond: increased output rates, reduced usage of spare parts, and lower production costs.

    - Improvement in Production Efficiency: the project has significantly enhanced production efficiency by reducing repetitive labor and minimizing production downtime.

    - Achieving Energy Savings: reduced electricity usage and a decreased need for personnel-related safety protection facilities.

    - Talent Development: The project has also successfully trained >100 high-level technical professionals, further strengthening the factory's expertise in advanced technologies.

2.3 Potential and Limitations of AI in Manufacturing Development

- From the case studies of both domestic and international companies, including Corning, it is clear that artificial intelligence holds significant potential for applications in the manufacturing sector. However, AI implementation in manufacturing still faces multiple constraints.

- The scale for AI applications in Chinese manufacturing has been growing year by year, but the overall penetration rate remains low. As of 2023, AI adoption rates in top European manufacturing enterprises exceeded 30%, in Japanese manufacturing enterprises approached 30%, and in U.S. manufacturing enterprises stood at 28%. In contrast, Chinese manufacturing enterprises had an AI adoption rate of less than 11%. To improve adoption rates, there is a need for more scenario-based applications to be implemented.

- The challenges of implementing AI in manufacturing scenarios primarily include:

    - Unclear Objectives and Value: Many enterprises struggle to identify how AI applications can deliver the greatest value. Some companies conduct pilot programs based on specific cases, but they lack a strategic, system-wide approach rooted in overall business goals. This results in fragmented AI investments, redundant efforts, and difficulties in focusing on high-potential, scalable scenarios.

    - Shortage of Key Talent and Collaboration Mechanisms: AI-driven transformations often require restructuring business processes and roles & responsibilities. However, there are gaps in understanding between business teams and digital teams. In many Chinese enterprises, digital teams hold relatively weak positions within the organization, which exacerbates this disconnect. Additionally, critical roles such as modeling software engineers and data governance specialists face a tight supply-demand imbalance in the Chinese market, with high recruitment difficulty. This makes it challenging for enterprises to quickly assemble effective teams.

    - Lack of Organizational Momentum and Transformation Mechanisms: While management typically places a strong emphasis on AI, there is often a lack of clear accountability and mechanisms at the operational level to drive implementation. This disconnect hampers the effective transmission of strategic goals, resulting in insufficient motivation for transformation. On the business front line, due to fixed mindset, teams may not understand or be willing to use AI.

    - Diverse Needs and Inconsistent Readiness for Smart Manufacturing: The varying levels of readiness for intelligent manufacturing and the diversity of needs across enterprises make it difficult to adopt uniform AI solutions. The high real-time, reliability, and accuracy requirements of manufacturing scenarios further increase the difficulty of implementation. The diversity of manufacturing AI application scenarios adds to the cost of deployment, and concerns about the cost-effec-

tiveness of implementation often deter enterprises from moving forward.

- The challenges faced by enterprises in promoting AI applications on their own highlight the need for government intervention, support, and guidance.
    - On one hand, the government can collaborate with universities and leading enterprises to drive breakthroughs in core technologies and their commercialization, as well as to develop scalable and generalizable AI solutions for application scenarios. It can also draft detailed operational guidelines for specific application scenarios to facilitate implementation.
    - On the other hand, the government can promote steady scenario implementation by providing stable, high-speed networks, extensive storage resources, and secure data services. Additionally, the government can actively attract and cultivate high-end AI talent to ensure enterprises have the human resources needed to expand AI adoption.

3. Many advanced cities around the world have adopted the promotion of AI-driven intelligent manufacturing as a core strategy

- Here are several representative cases, showcasing different promotion models and areas of focus:

Singapore - AI-Driven Intelligent Manufacturing under the "Smart Nation" Strategy

- Promotion model: follows the approach of "Government Top-Level Design + Strong R&D Investment + Global Collaboration."
- Key Initiatives:
    - "Research, Innovation, and Enterprise 2025 Plan" (RIE2025):
        - The government has allocated SGD 25 billion, with "Industry 4.0" being one of the priority areas.
        - The initiative aims to promote the adoption of AI, machine learning, and robotics in critical manufacturing sectors, such as precision engineering, semiconductors, and biomedical sciences.
    - AI Singapore (AISG):
        - A national AI program spearheaded by the government, which includes initiatives like the "100 Experiments" program.
        - Many projects under this program are conducted in collaboration with manufacturing enterprises,

addressing real-world industrial challenges such as predictive maintenance, visual quality inspection, and supply chain optimization.

- Advanced Remanufacturing and Technology Centre (ARTC):
  - A public-private partnership platform led by the Agency for Science, Technology and Research (A*STAR).
  - It brings together multinational corporations, small and medium-sized enterprises (SMEs), and research institutions to focus on rapidly translating advanced manufacturing technologies, including AI, from the lab to the market.

- Key Characteristics:
  - The government plays a pivotal role as a "catalyst" and "connector" by providing funding, policies, and platforms. Through these efforts, Singapore effectively links global leading companies, local businesses, and research institutions to collaboratively address the challenges of applying AI in manufacturing. This integrated approach ensures that AI technologies are rapidly adopted and generate tangible outcomes in the manufacturing sector.

Munich, Germany - "AI + Industry 4.0" Practices in a Traditional Industrial Hub

- Promotion model: "Strong Industrial Foundations + Research Institution Leadership + SME Empowerment."
- Key Initiatives:
  - Technical University of Munich (TUM) and AI Research Institutes:
    - TUM, one of the world's top engineering universities, hosts a Center for Artificial Intelligence and Machine Learning, which is a European academic hub.
    - The university supplies cutting-edge technologies and a steady stream of talent to the industry.
  - UnternehmerTUM (TUM's Entrepreneurship Center):
    - One of the largest innovation and entrepreneurship centers in Europe.
    - It has established AI application labs and prototyping workshops to help manufacturing startups and traditional small- and medium-sized enterprises (SMEs) test and integrate AI solutions.
  - Local Industry Leaders as Pioneers:

- Global giants headquartered in Munich, such as Siemens and BMW, heavily utilize AI in their factories and R&D centers.
- Applications include digital twins, autonomous logistics vehicles, and AI-driven production scheduling, which serve as technological showcases and drive innovation across the supply chain.

- Key Characteristics:
  - Munich leverages the innovation capabilities of its world-class universities and research institutions while ensuring that the benefits of technology extend to Germany's "hidden champions" and mid-sized enterprises, which form the backbone of the country's economy. This approach minimizes the risk of a technological divide and ensures that AI adoption is inclusive and widespread.

Pittsburgh, USA - AI-Driven Revival of a Rust Belt Industrial City

- Promotion Model: "Academic Leadership + Startup Ecosystem + Traditional Industry Upgrades"
- Key Initiatives:
  - Carnegie Mellon University (CMU):
    - With its globally top-ranked computer science and robotics programs, CMU acts as the core engine of Pittsburgh's AI ecosystem.
    - The university not only conducts cutting-edge research but also actively fosters entrepreneurship and technology transfer among faculty and students.
  - Leading Robotics Industry Cluster:
    - Pittsburgh has become home to prominent robotics and AI companies, such as Argo AI (autonomous vehicles) and Aurora Innovation (autonomous driving).
    - While initially developed for transportation, these technologies' perception, decision-making, and control systems are now being applied to smart manufacturing, including automated guided vehicles (AGVs) and collaborative robots.
  - AI Transformation of Traditional Manufacturing:
    - Local government and support organizations encourage collaboration between AI companies and traditional manufacturing industries.
    - Examples include using AI to detect defects in steel production and optimize energy consump-

tion, enabling these legacy industries to enhance efficiency and competitiveness.

- Key Characteristics:
    - Pittsburgh serves as a classic example of "new industries driven by academic institutions, and new technologies revitalizing traditional industries." This transformation demonstrates that even without a top-down government strategy, a bottom-up approach—leveraging world-class universities and an active venture capital ecosystem—can create a robust AI industry cluster. Moreover, this innovation-driven ecosystem can extend its benefits to traditional manufacturing, achieving economic regeneration and sustainable growth.

Tokyo, Japan - AI-Driven Smart Manufacturing to Address Social Challenges

- Promotion Model: "Robotics + Human-Machine Collaboration + Addressing Social Challenges"
- Key Initiatives:
    - "Society 5.0" Strategy:
        - As Japan's national strategy, "Society 5.0" aims to address both economic development and social issues by deeply integrating the virtual and physical worlds.
        - AI-driven smart manufacturing is a core component of this vision, with a focus on creating innovative solutions to societal challenges.
    - Robotics First:
        - Japan, already a leader in industrial robotics, is now focusing on developing smarter, user-friendly, and safer AI-integrated robots that can collaborate with humans.
        - Companies like Fanuc are embedding AI technologies into their robots, enabling self-learning and adaptive production capabilities to enhance manufacturing efficiency.
    - Empowering SMEs:
        - The Japanese government is supporting small- and medium-sized enterprises (SMEs) through initiatives like the "Productivity Enhancement Support Services" program.
        - This includes subsidies and consultation services to help SMEs adopt advanced technologies such as AI and robotics, addressing labor shortages and boosting productivity.
- Key Characteristics:

    - The application of AI in Tokyo's manufacturing sector is strongly driven by social needs, focusing on solving critical issues like aging populations and labor shortages. The approach is not about adopting AI for the sake of the technology itself but about leveraging AI and robotics to address urgent societal challenges. This ensures the stability of Japan's manufacturing base while maintaining its global competitiveness.

- These cases demonstrate that there is no single template for the successful promotion of AI-driven intelligent manufacturing in cities. However, they share common characteristics:

    - Leveraging Local Advantages: Successful cities tightly integrate their unique strengths, such as industrial foundations, research capabilities, and policy resources, to drive their AI initiatives.

    - Focusing on Core Problems: Each city identifies and addresses its key challenges, whether it's industrial upgrading, labor shortages, or urban revitalization, ensuring that AI solutions are problem-driven rather than technology-driven.

    - Building Robust Ecosystems: By fostering collaboration among governments, enterprises, universities, and startups, these cities create dynamic ecosystems that enable innovation, technology transfer, and widespread adoption of AI solutions.

- For Chinese cities, these models provide valuable insights. By analyzing their own economic, social, and technological landscapes, they can adapt these approaches to find the development path best suited to their specific circumstances. This tailored strategy can help Chinese cities harness the transformative power of AI to achieve sustainable growth and global competitiveness.

4. Recommendations for Chongqing's AI Development

- As a key industrial base and technology innovation hub in western China, Chongqing has significant advantages for developing artificial intelligence (AI) and intelligent manufacturing, such as its industrial foundation, policy support, and strategic location. Chongqing has prioritized AI-enabled manufacturing and has already introduced the "Chongqing Action Plan for AI-Enabled High-Quality Manufacturing Development (2025-2027 Draft)", outlining clear development goals and concrete measures. Based on the challenges faced by enterprises in promoting AI adoption, we recommend that Chongqing continue to strengthen efforts in areas such as technology innovation and commercialization, talent recruitment, and infrastructure development.

4.1 Drive Core Technology Breakthroughs and Commercialization

- Focus on Key Technological Breakthroughs: Rely on platforms such as Chongqing University and Western (Chengdu-Chongqing) Science City, and collaborate with enterprises like Huawei and Alibaba Cloud

to tackle critical technologies such as industrial AI algorithms, edge computing, and flexible robotics.

- Accelerate Industry-Academia-Research Collaboration: Encourage universities to launch interdisciplinary programs (e.g., AI + mechanical engineering) to cultivate multi-skilled talent. Support leading enterprises like Changan Automobile and BOE to spearhead "task-based" projects, accelerating the commercialization of research achievements.

4.2 Improve Infrastructure and Strengthen the Digital Foundation

- Expand Digital Connectivity: Accelerate the deployment of 5G private networks and industrial internet identifier nodes. Promote the adoption of cloud computing, big data, and lightweight AI tools among small and medium-sized enterprises (SMEs) to enhance their digital transformation at a low cost.

- Draw Inspiration from Shanghai's Smart City Model: For example, Shanghai Telecom's "Smart Cloud Shanghai" initiative launched in 2025 established an AI-powered city intelligence system, featuring a city-level AI foundation, full-coverage AI networks, and scalable application capabilities. Chongqing could adopt a similar framework to create a sustainable urban AI hub.

4.3 Deepen Global Collaboration and Talent Development

- Leverage International Resources: Introduce advanced AI technologies and capital from abroad, establish joint laboratories, and organize internationally influential events like an AI manufacturing summit.

- Enhance Talent Development: Implement a "Chongqing Talent Plan" to provide tailored, case-by-case support for top AI professionals.

- Learn from Xiamen's AI Talent Policy: Xiamen's "AI Industry Talent 8 Measures" initiative systematically supports talent recruitment, training, evaluation, and incentives. For example, through its "Double Hundred Plan," AI-specific projects can receive up to 5 million RMB in startup funding. Additionally, Xiamen expands postdoctoral recruitment in AI, offering up to 150,000 RMB annual subsidies for up to two years. Similar policies could be adopted in Chongqing to attract and nurture AI talent.

4.4 Focus on Demonstrative Applications in Key Industries

- To advance AI development and promote multi-sector applications, Chongqing should leverage its regional characteristics and industrial strengths to focus on demonstrative applications in the following key areas, driving the transformation and upgrading of traditional industries and fostering intelligent development:

- Automotive Industry: Promote the application of AI in smart driving R&D and supply chain optimization to enhance production efficiency and technology levels. For example, Changan Automobile's "Lighthouse Factory" in Chongqing utilizes AI to optimize scheduling, quality inspection, and resource allocation,

achieving highly coordinated production processes. Additionally, accelerate the R&D and commercialization of autonomous vehicles to meet user demands for safety, convenience, and intelligence.

- Electronics Manufacturing: Employ AI visual inspection technology to significantly improve detection precision and efficiency while reducing errors caused by human intervention. Integrate intelligent warehousing and logistics with robotics, AI algorithms, and IoT technologies to enable efficient material storage and dispatch, reducing logistics costs. Chongqing Foxconn's "Dark Factory" project is a benchmark in the electronics manufacturing sector, implementing fully automated production processes to minimize manual operations.

- Equipment Manufacturing: Apply AI-powered predictive maintenance systems to collect and analyze real-time equipment data, enabling the early detection of faults and reducing downtime losses. In the wind power sector, integrate AI and IoT technologies to build remote operation and maintenance systems, allowing real-time monitoring and data analysis of wind turbines. This will optimize maintenance strategies, improve equipment efficiency, and support the development of green energy.

- Outcome-Oriented Role Models: By focusing on demonstrative applications in automotive, electronics manufacturing, and equipment manufacturing, Chongqing can maximize AI's enabling role in driving regional economic development, injecting new momentum into high-quality growth, and accelerating intelligent transformation across industries.

4.5 Safeguard Measures

- Data Security: Establish an industrial data classification management system, applying differentiated protection strategies based on the importance and sensitivity of data. Pilot blockchain technology to ensure the trustworthiness and transparency of supply chain data through decentralized storage and tamper-proof features. Additionally, strengthen data encryption and cybersecurity technologies to ensure data security throughout its lifecycle.

- Evaluation Mechanism: Develop an AI-enabled smart manufacturing development index to assess the effectiveness of applications across dimensions such as technological depth, production efficiency, and economic benefits. Publish white papers regularly to summarize industry trends, policy directions, and exemplary use cases, providing authoritative references for stakeholders. The evaluation mechanism can also be used to identify challenges, aiding in the optimization of technologies and the upgrading of industries.

By implementing these measures, Chongqing can gradually establish a virtuous cycle of "core technology breakthroughs – scenario applications – industry cluster development," positioning itself as a leading hub for AI-enabled intelligent manufacturing in western and central China. Careful attention should be given to balancing short-term investments with long-term returns, avoiding redundant construction, and emphasizing differentiated competitiveness.

Conclusion

Leveraging intelligent technologies to enhance industrial efficiency and improve production management is the essential path to achieving high-quality development and global competitiveness in manufacturing. We firmly believe that by drawing on global best practices in intelligent manufacturing and integrating Chongqing's unique resources and robust manufacturing foundation, the city will successfully chart a distinctive path for the deep integration of artificial intelligence and manufacturing.

In the future, through close industry partnership, Chongqing will further enhance its urban competitiveness, evolve into a key national center for advanced manufacturing, and write its own new chapter of high-quality development.

References

[1] "Research on Strategies for High-Quality Development of Advanced Manufacturing During the 14th Five-Year Plan Period"

[2] "2025 Chongqing Productivity Development Forecast"

[3] "2025 World Artificial Intelligence Conference Materials"

[4] "2024 Chongqing Industrial and Information Technology Development Overview"

[5] "AI+ Reshaping the Competitive Advantage of Manufacturing"

[6] "Leading Enterprises Intensify Investments in 'Industrial + AI'"

[7] "Chongqing Action Plan for Strengthening Human Resource Services to Support High-Quality Manufacturing Development (2025-2027)"

[8] "Chongqing Action Plan for AI-Enabled High-Quality Manufacturing Development (2025-2027 Draft)"

[9] "Shenzhen Action Plan for Accelerating the Development of an AI Pioneer City (2025-2026)"

[10] "McKinsey's Insights on Creating Value After the AI Boom"

[11] "Current Status, Challenges, and Recommendations for AI Applications in Manufacturing Scenarios"

Building an AI Application Hub: Driving the High-Quality Development of Chongqing's Food and Agricultural Product Processing Industry through "AI+"

João Abecasis
Executive Vice President, Carlsberg Group

Abstract

The food and agricultural product processing industry (hereinafter referred to as the "food-agriculture industry") is among the three pillar industries of RMB 500 billion scale in Chongqing's "33618 Modern Industrial Cluster System." Guided by the State Council's Artificial Intelligence Plus (AI+) Action, integrating AI has become an essential course for industrial upgrading. This paper responds to the national strategies while aligning with Chongqing's development goals, focusing on the application and development pathway of AI in the food-agriculture industry.

Drawing on Carlsberg Group's global practices, this paper proposes four strategic measures: building an international cooperation platform, promoting end-to-end AI applications, cultivating a talent hub, and convening international summits. Together, these initiatives aim to support Chongqing in developing a food-agriculture industry hub of global influence.

Keywords: AI+, Chongqing, food-agriculture industry, intelligent manufacturing, green development

1. Introduction

The rapid advance of artificial intelligence (AI) is reshaping the global industrial landscape and has become a key driver of high-quality development. China has elevated AI to a national strategic priority, incorporating the "AI+ Action" into the Government Work Report for two consecutive years. In August 2025, the State Council issued the *Opinions on Deeply Implementing the "Artificial Intelligence Plus (AI+) Action"*. This document set a goal of achieving broad AI adoption across six priority areas by 2027. As a vital component of the national economy, the food-agriculture industry urgently requires AI adoption to accelerate the shift from "manufacturing" to "intelligent manufacturing," and from "incremental growth" to "quality upgrading."

2. Context: Chongqing's Industrial Advantages

Chongqing has proposed the "33618 Modern Industrial Cluster System," in which the food-agriculture industry is positioned as one of the three RMB 500 billion-scale pillar industries. This cluster covers beer, beverages, condiments, meat products, grain and oil processing, and functional foods. The sector benefits from a solid industrial base, broad market prospects, and rich brand assets.

At the same time, Chongqing has developed strong technical capabilities in intelligent manufacturing, green development, and the industrial internet. These conditions lay a solid foundation for deep AI integration. The convergence of national policy and local strengths provides unprecedented opportunities for AI-driven upgrading.

3. Case Study: Carlsberg's "AI+" Practices

Carlsberg Group, as one of the world's leading brewers, has systematically advanced AI applications worldwide. Its practices offer a useful example for intelligent transformation in the food and beverage industries, offering insights into smarter, greener, and more innovative brewing and more personalized consumer experiences.

3.1 AI+ Intelligent Manufacturing

Carlsberg has deployed Manufacturing Execution System (MES) in packaging production. Sensors and data collection modules are installed on key equipment, enabling real-time monitoring, anomaly alerts, and automatic fault diagnosis. Production data is synchronized to the cloud. AI algorithms then perform big data analysis to achieve online production management. Staff only need to input the required output, and the system automatically calculates material needs and machine start-up times, achieving "self-ordering". This significantly improves production efficiency and accuracy, while reducing downtime and maintenance costs.

Carlsberg is also advancing its Supply Chain Digital Platform, which integrates factory production data, provides real-time performance dashboards, and applies AI analytics to optimize processes, moving further toward fully digitalized breweries.

3.2 AI+ Energy Management

Carlsberg has implemented Energy Management System (EMS) to monitor energy production, distribution, and consumption. Automated data collection and real-time monitoring help detect anomalies, optimize energy structure, and lower consumption and emissions.

EMS coordinates steam, compressed air, electricity, and water use across production stages. This enables dynamic resource allocation, preventing waste and duplication. The system also predicts future energy demand based on historical and real-time data, supporting scientific energy planning and enhancing sustainability, thereby

advancing low-carbon and green development.

3.3 AI+ Smart Logistics

Carlsberg has implemented an Automated Guided Vehicle (AGV) project that integrates AGV forklifts, a scheduling system, and an automated management platform with Warehouse Management System (WMS). This enables automated material handling tasks such as unloading, warehousing, line feeding, and empty pallet return. The system improves both efficiency and accuracy.

Carlsberg has also applied Advanced Driving Assistance System (ADAS). Using embedded terminals and multiple cameras, the system senses the environment, predicts potential risks, and issues alerts. This reduces collision accidents and enhances transport safety.

3.4 AI+ Financial Management

Carlsberg has developed generative AI models that support report summarization, policy Q&A, cost analysis, and budget forecasting. Combined with Process Robotic Automation (PRA), these tools allow automatic calculation, entry, and distribution of KPIs and cost-saving data, shifting financial management from manual processing to intelligent analysis.

This system not only improves financial efficiency but also strengthens responsiveness to market changes. In doing so, it provides solid data support for decision-making.

3.5 AI+ Marketing

Carlsberg applies AI in product innovation, Artificial Intelligence Generated Content (AIGC) for content creation, and consumer behavior analytics. In product innovation, AI platforms refine concept descriptions and packaging designs, boosting creative efficiency. In content production, e-commerce teams use AIGC tools for video remixing, scenario image generation, virtual human livestreaming, and AI music creation. This enables fast content generation and multi-platform distribution.

In consumer insights, AI analytics reveal consumer behavior patterns and market trends. These insights guide personalized campaigns that target specific groups. As a result, engagement, marketing efficiency, and conversion rates all improve.

4. Strategic Recommendations for Chongqing

4.1 Build an AI+ International Cooperation Platform

It is recommended that the Chongqing Municipal Government lead the creation of an “AI+ Food-Agriculture Industry International Cooperation Platform” or innovation center. This platform should bring together leading enterprises and research institutions to introduce advanced technologies and management practices. It should also

promote international exchanges and technology transfer in areas such as intelligent quality inspection, green packaging, supply chain optimization, and nutrition and health.

Chongqing should also engage in international standard-setting. Aligning local technologies with global standards would enhance Chongqing's global influence in AI+ for the food-agriculture sector. By pooling research resources, enterprise strengths, and policy support, this open and shared platform could both serve local upgrading and contribute to national and global development.

4.2 Promote End-to-end AI Applications

Dedicated funds and supportive policies should encourage AI adoption across procurement, manufacturing, logistics, and marketing. A unified data platform and common standards would allow upstream and downstream enterprises to operate collaboratively. Demonstration factories and benchmark projects should be created to provide replicable and scalable models for transformation.

4.3 Cultivate an AI+ Talent Hub

Chongqing should leverage its educational resources to build a multi-level "AI+ food-agriculture industry" talent development system. At the basic level, training bases could introduce advanced curricula and expert resources to train technicians, engineers, and managers. At the high end, universities should collaborate internationally to create interdisciplinary programs and joint laboratories, promoting both research translation and frontier applications.

International exchanges, scholarships, and industry-academia cooperation platforms can attract overseas experts to Chongqing. Over time, a complete talent chain—from skills training to research innovation and industry application—can be formed to support intelligent upgrading.

4.4 Host an AI+ International Summit

Chongqing can use platforms such as the Smart China Expo and the Western China International Fair to host regular "AI+ Food-Agriculture Industry International Summits." These events would bring together global enterprises, research institutions, and associations to exchange best practices in intelligent manufacturing, green development, and supply chain optimization. The summit could include standard-setting sessions, achievement showcases, and project matchmaking. This would help localize international rules and technologies while promoting Chongqing's practices globally.

5. Conclusion

Under the national AI+ strategy, Chongqing already holds policy, industrial, and technological advantages for integrating AI into the food-agriculture sector. The measures proposed in this paper—international cooperation

platforms, end-to-end applications, talent hubs, demonstration zones, and international summits—can provide strategic guidance for industrial upgrading.

Looking ahead, Chongqing can position “AI+” as the core driver of development. By coordinating intelligent manufacturing, green development, supply chain optimization, marketing, and talent training, it can gradually form an open and collaborative development ecosystem. This will not only accelerate Chongqing’s transformation into an innovation hub in the food-agriculture industry, but also provide valuable insights for industrial transformation nationwide and worldwide.

Perspectives for the Use of AI in Societies with Shrinking and Aging Populations

Mitsubishi UFJ Financial Group, Inc.

1. Introduction

With the spread of generative AI, improved productivity powered by AI (especially generative AI) is attracting attention across industry sectors. As noted in the background for the theme of this year's meeting, China has also signaled its intent to integrate AI into all aspects of society and the economy.

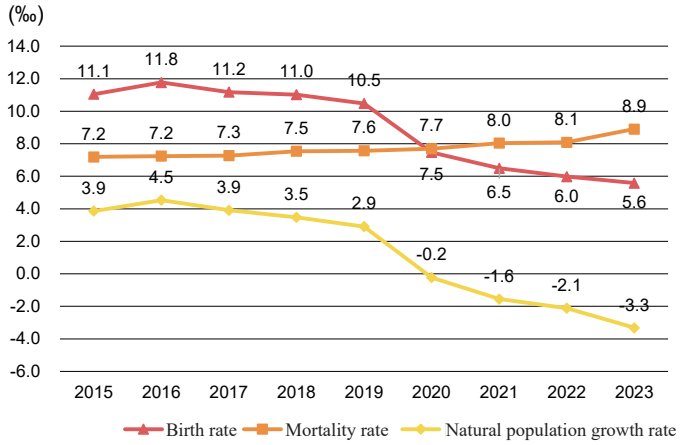
In this report, I will introduce examples of utilization of AI and other technologies in Japan and make recommendations to the Chongqing municipal government about the perspectives that need to be considered to further implement AI in the tertiary sector today, especially in the commercial and service industries. In particular, I will focus on tackling social issues such as population decline and aging.

2. Chongqing facing population decline and aging

It has been pointed out that the population of Chongqing is decreasing as well. The year-end resident population of Chongqing peaked at 32.13 million in 2022, then declined to 31.91 million in 2023 and 31.90 million in 2024. The birthrate has been below 10‰ (per thousand) since 2020 and remains on a downward trend. Additionally, the mortality rate is on the rise, and the natural population growth rate, calculated by subtracting the mortality rate from the birth rate, has been negative since 2020.[1]

[1] *National Data website of China's National Bureau of Statistics. https://data.stats.gov.cn/easyquery.htm?cn=E0103*

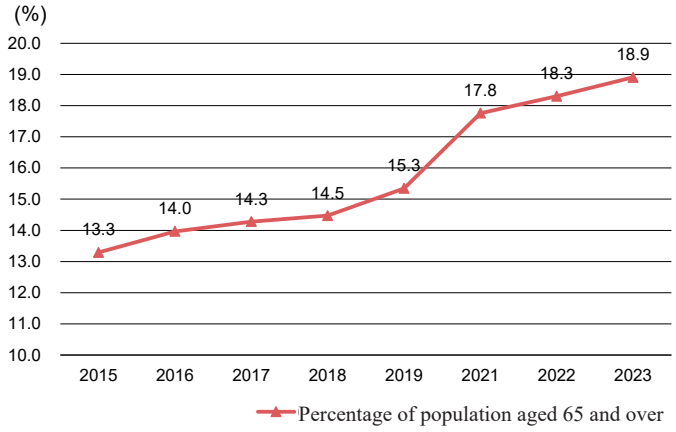
Chart 1: Birth rates, mortality rates, and natural population growth rates in Chongqing



Source: Based on the National Data website of China's National Bureau of Statistics. ‰ indicates per thousand people.

Also, at least as suggested by a sample survey, the percentage of the population aged 65 and over has been on an upward trend, rising by 5.6% between 2015 and 2023.[2]

Chart 2: Percentage of population aged 65 and over



Source: Based on the National Data website of China's National Bureau of Statistics.

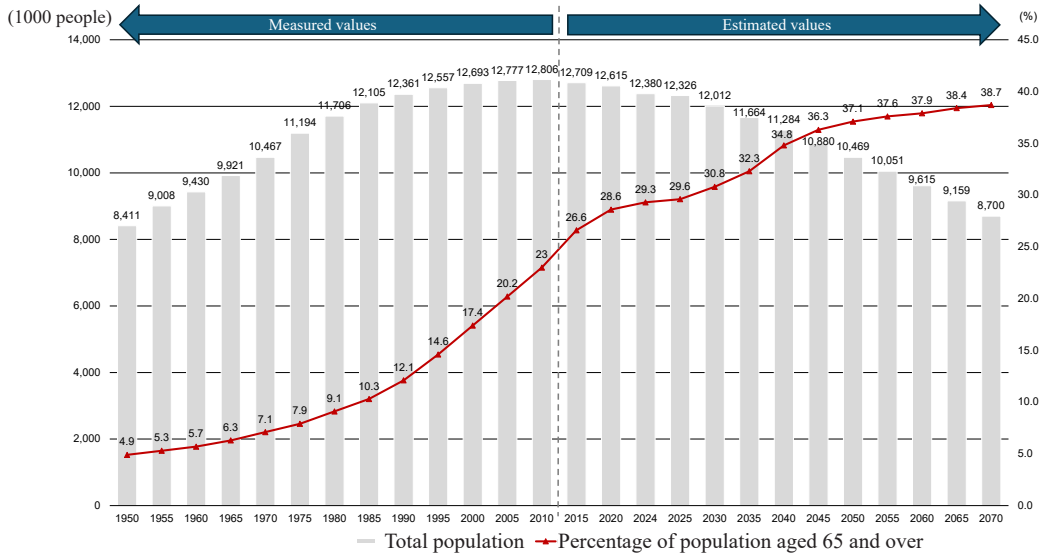
These figures show that the population of Chongqing is shrinking, and it is forecasted to continue to shrink due to natural attrition in parallel with aging.

Meanwhile, in Japan, the population peaked at about 128.08 million in 2008 and then began to decline, reaching about 123.8 million as of October 2024. This marked 14 consecutive years of decline. In addition, the percent-

[2] *Calculated based on the sample survey results obtained from the National Data website of China's National Bureau of Statistics by dividing "population aged 65 and over (sample survey)" by "population (sample survey)." The chart does not include figures for 2020 because a national population census was conducted instead of the sample survey. https://data.stats.gov.cn/easyquery.htm?cn=E0103*

age of the population aged 65 or older to the total population (hereinafter, the aging rate) has also been climbing. According to the national census, the aging rate continued to rise from 20.2% in 2005 to 23.0% in 2010, 26.6% in 2015, and 28.6% in 2020. In 2024, it reached a record high of 29.3% based on population estimates by Japan's Ministry of Internal Affairs and Communications (confirmed values as of October 1, 2024).[3]

Chart 3: Trends in Japan's total population and aging rate



Source: Based on the 2025 White Paper on the Aging Society by Japan's Cabinet Office (PDF version).

As explained, Japan's population has been declining since 2008, but in 2005, it was already similar to Chongqing's current situation in terms of the aging rate. Twenty years later, the trend of population decline and aging continues, and labor shortage is recognized as a serious social issue. Compared to China and other countries, Japan's aging rate as of 2020 was already among the highest in the world.

In this context, AI use cases in Japan tend to place emphasis on addressing labor shortages, but given the pace of population aging, there are many situations in which the elderly must be taken into account when implementing AI and other technologies. As the population of Chongqing is forecasted to continue shrinking and aging similarly to that of Japan over the past 20 years, Chongqing could draw valuable insights from Japanese AI use cases aimed at resolving social issues such as labor shortages and population aging. Now, I will introduce examples of how AI has been adopted and utilized in response to labor shortages and an aging population in Japan.

3. Examples of using AI to improve efficiency and save labor in response to an aging population

While many of the successful examples of AI adoption in China focus on maximizing customer satisfaction

[3] *2025 White Paper on the Aging Society by Japan's Cabinet Office (PDF version), p. 3. https://www8.cao.go.jp/kourei/whitepaper/w-2025/zenbun/pdf/1s1s_01.pdf*

and experience, AI use cases in Japan are strongly oriented towards addressing labor shortages. In view of population decline and the impact of AI on the elderly, I will introduce cases that describe how AI is being integrated into today's service industry in Japan, which could serve as a reference for Chongqing given its current situation.

(1)Using AI to transform customer service and call center operations

In Japan, the turnover rate of call center workers is high, and many call center operators are suffering from labor shortages. In this context, AI has been increasingly adopted in call center operations. For example, Bellsystem 24, Inc. has developed a service that uses AI to answer calls in the manner of an operator, which is scheduled to launch in 2026. By using a technology called Hybrid RAG and referring to call data obtained from call center operations to acquire "knowledge," its answers are expected to reach an accuracy rate of about 95%.[4]

By developing AI-powered customer service processes without human intervention, the company aims to shift to a model that could generate profits in the call center business despite the high turnover rate and labor shortages, in a market that seems to have peaked out. Some forecasts suggest that the company might be able to reduce the work force by about 50%.[5] Going forward, as the population of Chongqing is expected to decrease as it continues aging, this perspective could serve as a reference for using AI to develop operational frameworks premised on labor shortages.

(2) Local governments developing services for residents using AI-powered facial recognition

Resident services provided by local governments can be said to be part of the service industry in a broad sense, and the use of AI is increasing in this domain as well. In the town of Ikata in Ehime prefecture, the local government is taking the lead in implementing facial recognition technologies that allow residents to utilize services including medical services, online medical care, health management, and shopping with a "face pass."

Users can access a variety of services by registering photos of their faces at government offices and linking them to resident databases. For example, if they sign up for "Sada Pay," a digital gift certificate with facial recognition, the system allows them to make cashless payments by simply showing their faces to in-store devices, without using smartphones or credit cards.[6]

Additionally, in October 2024, facial recognition was used in a pilot test for tracking reception at disaster evacuation centers, where an existing event attendance registration function aimed to support local communities was linked to resident databases.[7] Reception procedures at evacuation centers usually consist of filling out paper forms; however,

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[4] *Bellsystem 24, Inc. Published in Nihon Keizai Shimbun. https://gai.bell24.co.jp/ja/news/news/20250806/*

[5] *Nihon Keizai Shimbun, online edition. Bellsystem 24 to Fully Automate Call Centers with AI by 2026. 50% Workforce Reduction, also in External Sales. https://www.nikkei.com/article/DGXZQOUC2320Q0T20C25A7000000/*

[6] *Example of Improving Operational Efficiency Using a Facial Recognition System (Ikata, Ehime Prefecture). https://www.pref.ehime.jp/uploaded/attachment/133085.pdf*

[7] *Scala, Inc. Pilot Test of a Facial Recognition System for Identity Confirmation During a Disaster.https://scalagrp.jp/news/2024/11-ikata/*

facial recognition will make it possible to grasp evacuation center occupancy and residents' evacuation status in real time. On top of that, when they arrive at the center, the waiting time will be greatly shortened thanks to the "face pass" system, which is expected to reduce the man-hours and burden on local government employees.

In the future, the database will be enhanced with medical data for use in health management and online medical care, as well as in local transportation, by linking facial recognition data with resident data. For example, based on the accumulated facial recognition data, initiatives are underway that could enable evacuation centers to confirm which residents have been evacuated during a disaster using facial recognition and obtain information about evacuees' health and required medication. In addition to increasing convenience by allowing residents to make payments and access services without smartphones or credit cards, the plan envisages leveraging users' data to improve the efficiency of local government operations, formulate data-based policies, and reduce the burden on government officials.

In Chongqing, too, the cost of providing public services may become an inescapable issue as the population continues to shrink and grow older. Some senior citizens might not own an IT device or be able to use it proficiently. Therefore, from the perspective of service providers, using facial recognition to provide services for the elderly will contribute to ensuring the availability of high-quality services even amid labor shortages. On the other hand, from the viewpoint of elderly citizens, it may be noted that even those without digital devices or with low digital literacy will be able to easily access these services on par with other users.

(3) Addressing issues related to the use of AI by the elderly

As the population ages and AI becomes more widespread, senior citizens are likely to use AI in a growing number of situations. However, if their AI literacy is low, they might misunderstand AI and the outputs of AI-powered services, be deceived by malicious information, or become victims of crimes. Also, if elderly people are excessively afraid of such risks, the spread of AI in society may be hindered, and the supply of services for the elderly may become insufficient in societies with shrinking and aging populations. In view of this issue, I will discuss the damages caused by crimes related to elderly people's use of IT in Japan, and introduce examples of Japanese initiatives that can serve as a reference for elderly people's safe use of AI services.

① IT use by the elderly in Japan

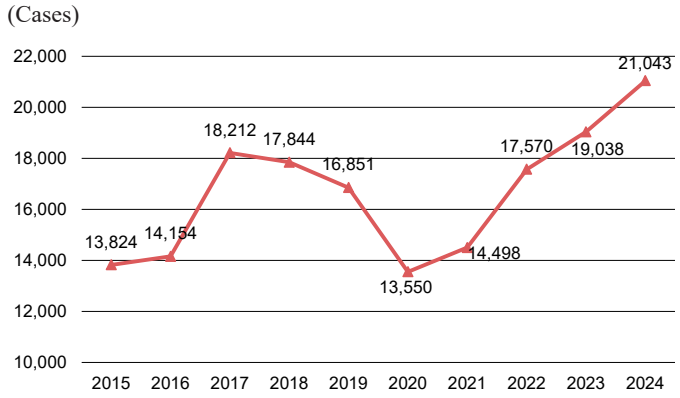
Among the challenges faced by the elderly as users of AI are the high proportion of people who do not own an IT device and the low internet use rate. According to the Communications Usage Trend Survey conducted by the Ministry of Internal Affairs and Communications in 2024, the smartphone ownership rate was 87.0% among people in their 60s, 67.5% among those in their 70s, and 30.7% among those aged 80 or older. Regarding internet use in the past year, 87.3% of citizens in their 60s, 66.1% in their 70s, and 32.1% aged 80 or older answered that they had used the internet. In particular, among those in their 80s and older, the smartphone ownership rate and

internet usage rate drop dramatically.[8] Although it is possible that the percentage of elderly people who own smartphones and use the internet will increase in the future, many AI services are premised on internet access; therefore, there is a risk that AI services will not sufficiently reach the elderly if they do not have smartphones or use the internet.

② Elderly victims of fraud in Japan

Deepfakes require special attention as one of the biggest challenges facing older AI users. In China as well, the number of victims of fraud through telephone calls and other means is increasing with the spread of generative AI. In Japan, however, as population aging became evident before the spread of generative AI, there have been many victims of "special fraud," a type of crime in which a large number of unspecified individuals contact victims by phone or other means to gain their trust and obtain cash or other forms of money from them without any face-to-face interaction. The number of reported cases of special fraud increased about 1.6 times (21,043 cases) in 2024 compared to 13,550 cases reported in 2020. Cases involving elderly persons aged 65 or older were 13,738, accounting for 65.4% of the reported cases excluding corporate victims. Damage caused by special fraud also grew around 2.5 times (71.88 billion yen) in 2024 compared to the cases reported in 2021 (28.2 billion yen). The amount of damages rose by 26.62 billion yen between 2023 and 2024, indicating a sharp increase.[9]

Chart 4: Number of reported cases of special fraud

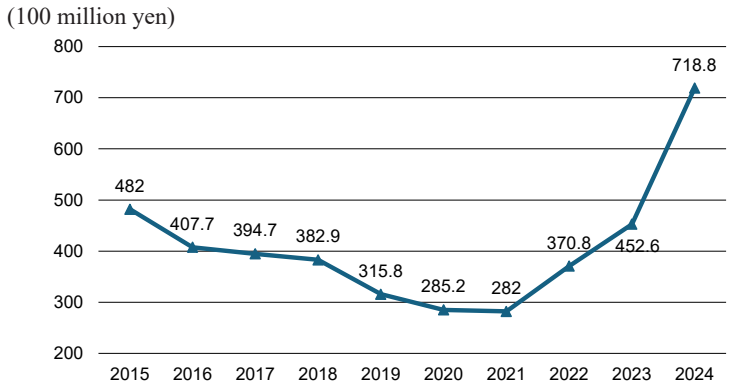


Source: Reports on and Arrests for Special Fraud, Online Investment Fraud, and Romance Scams in 2024, by Japan's National Police Agency.

[8] *Based on household statistics from the 2024 Communications Usage Trend Survey (household members).https://www.e-stat.go.jp/stat-search/files?page=1&layout=datalist&toukei=00200356&tstat=000001228811&cycle=0&year=20240&month=0&tclass1=000001228813*

[9] *Reports on and Arrests for Special Fraud, Online Investment Fraud, and Romance Scams in 2024, by Japan's National Police Agency.https://www.npa.go.jp/bureau/criminal/souni/tokusyusagi/hurikomesagi_toukei2024.pdf*

Chart 5: Amount of damages from special fraud



Source: Reports on and Arrests for Special Fraud, Online Investment Fraud, and Romance Scams in 2024, by Japan's National Police Agency.

These figures suggest that, in Japan, elderly victims account for a high percentage of fraud cases, and it is highly likely that the amount of damages to elderly people is also increasing. In addition, the number of reported cases and the amount of damages increased rapidly from 2023 to 2024, and the spread of generative AI could also be expanding damage from special fraud. In Chongqing, too, there are concerns that the number of elderly victims of AI scams will increase as the population ages and generative AI becomes more widespread. As a result, excessive fear of AI could hinder its social implementation.

③ Measures to mitigate concerns among the elderly and prevent AI crimes that target them

These survey results have made it clear that fast-aging Japan must address concerns among senior citizens about becoming AI users, as well as AI-related scams targeting them. In order to tackle these issues, Japan has focused on providing essential information to the elderly.

The Ministry of Internal Affairs and Communications is implementing the Digital Utilization Support Project to dispel the concerns of the elderly regarding the use of digital technologies. This initiative enables various population groups, including the elderly, to learn how to use digital devices and services in nearby locations from people in their community. It is mainly conducted by telecommunication carriers that act as the implementing organizations and offer various classes free of charge at their sales outlets (carrier shops).[10] Most of the content of the classes is related to the use of government services. However, they have also added information on generative AI and how to use services powered by generative AI since the project was allocated supplementary funding in fiscal year 2024.

[10] *There are 6,999 mobile phone carrier shops in Japan in 2025 according to Carrier Shop Expansion and List of Outlets and Agencies, Spring 2025, by MCA, Inc. https://www.mca.co.jp/itforecastreport/careershop-2025-spring/*

List of Classes Taught as Part of the Digital Utilization Support Project[11]

- Using the online portal site for My Number (Japan's individual ID number system)
- Applying for a My Number card on your smartphone
- Downloading an electronic certificate to your smartphone
- Using My Number as a health insurance card and registering an account to receive government benefits
- Using your smartphone to file your tax return (e-Tax)
- Using online medical services
- Assessing the urgency of illness and injuries with the nationwide emergency care app (Qsuke)
- Checking the risk of various disasters on the hazard map portal
- Using a flood navigator to view flood damage simulations
- Obtaining local information from maps by the Geospatial Information Authority
- Developing digital literacy to enjoy the internet safely and securely
- Checking pension information on your smartphone (Nenkin Net)
- **Using generative AI**
- **Using a text display telephone service (Yometel)**
- How to use online services provided by local governments
- How to access online administrative procedures provided by local government offices

Source: Digital Utilization Support Project by the Ministry of Internal Affairs and Communications. Only current classes are listed.

In fiscal year 2023, approximately 250,000 classes were taught at 6,522 locations nationwide, with a total of 470,000 participants. This project could serve as a reference for Chongqing in terms of large-scale initiatives sponsored by the government to boost digital literacy and alleviate concerns about digital technologies.

4. Conclusion

In this report, I introduced examples of how AI is being used in Japan, where the population is shrinking and aging, and highlighted the aspects that could serve as a reference for Chongqing.

First, in relation to population decline and aging in Japan, I presented a case in which AI services were developed in response to labor shortages. In a market affected by labor shortages and with low growth forecasts, the innovations at AI-powered customer service call centers could make it possible to operate with around half the

[11] *Digital Utilization Support Project by the Ministry of Internal Affairs and Communications. https://www.digi-katsu.go.jp/documents/R7/%E3%80%90%E6%A6%82%E8%A6%81%E3%80%91%E3%83%87%E3%82%B8%E3%82%BF%E3%83%AB%E6%B4%BB%E7%94%A8%E6%94%AF%E6%8F%B4%E6%8E%A8%E9%80%B2%E4%BA%8B%E6%A5%AD.pdf*

personnel without lowering service levels, as new technologies improve the quality of answers to the extent that AI could replace operators.

Next, I presented the case of Ikata, in Ehime prefecture, where an AI-powered facial recognition function has been utilized to reduce the burden on local governments facing serious labor shortages. In this initiative, the aim is also to improve public services for residents by linking residents' data held by the government with data obtained from facial recognition. This case in Ikata also highlights the usefulness of facial recognition, given that some senior citizens do not have any digital devices.

Since IT devices are not widely used by the elderly and special fraud is causing considerable damage in Japan, I pointed out the importance of improving the IT use rate and AI literacy, and introduced the Digital Utilization Support Project by the Ministry of Internal Affairs and Communications, which includes classes taught at mobile carrier shops across the country.

In each example, I highlighted the perspectives that could serve as a reference for Chongqing, and it can be concluded that there are two major perspectives that the Chongqing Municipal Government might need to consider going forward.

First, companies are strongly motivated to reduce man-hours and personnel through the use of AI; however, small companies may not have the capacity to develop and implement AI-powered services. Therefore, to maintain and improve the quality of services even amid labor shortages, the government will need to grant subsidies to support companies in using AI for higher productivity, and promote information sharing so that AI use cases will serve as a reference for these companies.

Second, for further social implementation of AI, Chongqing will need to address the risks faced by senior citizens as AI users. However, it will be difficult to find incentives for initiatives to increase digital literacy among the elderly and develop AI services prioritizing them unless this leads to profits for companies. Also, as local governments are fundamentally responsible for providing public services, the public sector will need to play a greater role in this regard. In the future, the Chongqing municipal government will also be required to actively support the improvement of senior citizens' digital literacy and the development, implementation, and widespread use of AI-powered services for this age group.

Moving forward, in addition to improving convenience for consumers and achieving further industrial advances, Chongqing should also consider perspectives that address social issues including population decline and aging, as in Japan's case, for wider AI use and further growth.

"Reshaping the Supply Chain" as the Engine: Chongqing's Path and Strategy for Advancing "AI + Advanced Manufacturing" Development

Schneider Electric

Background

Presently, the deep integration of Artificial Intelligence (AI) and advanced manufacturing has emerged as a pivotal driver of global industrial transformation, spurring explosive growth in the global smart manufacturing market. According to data from MarketsandMarkets[1], a market research and consulting firm, the global smart manufacturing market is expected to reach USD 263.21 billion by 2025 and rise to USD 479.17 billion by 2029, with a compound annual growth rate (CAGR) of 15.5%. In the niche sector of "AI + smart manufacturing", the market size is projected to range between USD 8 billion and USD 16 billion by 2025, and is anticipated to exceed USD 47 billion by 2030, with a remarkable growth rate of 40%-50%. The underlying driver of this growth lies in the global market's relentless pursuit of efficiency improvement, the urgent need for supply chain resilience, and the leapfrog advancement in technological maturity. In the course of this process, the Asian market—particularly China—has become the fastest-growing region, thanks to policy support and the advantage of a comprehensive industrial chain, and is expected to lead the world in CAGR from 2024 to 2029.[2] [3]

Traditional perceptions often restrict the application of AI in manufacturing to practices such as "replacing human labor", visual quality inspection, or predictive maintenance—essentially focusing on the optimization of individual links. However, the core of AI integration in advanced manufacturing lies in leveraging AI technologies to enhance the intelligence, automation and flexibility levels of manufacturing. Current technological breakthroughs are transitioning from "single-point applications" to "full-stack integration". AI is no longer just a tool for optimizing a specific aspect but has become a foundational capability for reconstructing the manufacturing paradigm, **primarily characterized by**:

- √ The in-depth application of Digital Twin enables production to evolve from "visualization" to "predictability and proactive decision-making". AI can perform real-time simulation and prediction of

[1] 《*Smart Manufacturing Market - Global Forecast to 2029*》, *https://www.marketsandmarkets.com/Market-Reports/smart-manufacturing-market-105448439.html*

[2] 《*Artificial Intelligence in Manufacturing Market - Global Forecast to 2030*》, *https://www.marketsandmarkets.com/Market-Reports/artificial-intelligence-manufacturing-market-72679105.html*

[3] 《*Artificial Intelligence in Manufacturing Market Size Report, 2025-2030*》, *https://www.grandviewresearch.com/industry-analysis/artificial-intelligence-in-manufacturing-market*

equipment failures and production bottlenecks in virtual spaces, thus enabling predictive maintenance and process optimization. This creates a "sandbox" for simulation and decision-making across the entire supply chain.

√ The deep integration of flexible manufacturing and supply chain resilience. By optimizing production processes and supply chain management, AI enables rapid response and dynamic adjustments for small-batch, multi-variety production, catering to market fluctuations and personalized demand. AI algorithms dynamically optimize inventory, balance capacity, and plan logistics, significantly enhancing the supply chain's risk resilience and efficiency.

√ Green smart manufacturing becoming imperative for enhancing cost efficiency. AI empowers energy management, low-carbon process innovation, and circular manufacturing models through real-time monitoring and optimization of energy consumption, emission prediction, and material usage optimization, **thereby** improving cost management and creating new business and social value.

√ The emergence of industrial agents. AI agents, based on large models and **reinforcement** learning, are being endowed with complex decision-making capabilities. These agents enable autonomous production scheduling, quality control, and energy management, and form a closed "perceive-decide-execute" loop, becoming intelligent, autonomous collaborative nodes within the supply chain network, serving as autonomous and collaborative nodes within the supply chain network.

It is evident that within the grand narrative of "AI + advanced manufacturing", AI not only empowers manufacturing systems with high flexibility, real-time responsiveness, and omnidirectional coordination but, more critically, catalyzes the intelligent evolution of supply chains. The deep integration of AI and advanced manufacturing is driving a profound transformation that extends from "smart production" to "smart supply chains". This shift is not only revolutionizing internal operations but also reshaping global industrial division of labor. Supply chains, once peripheral to manufacturing, have now emerged as the core engine of industrial upgrading. Consequently, the future of manufacturing competition is transitioning from individual enterprise rivalry to competition across the entire supply chain ecosystem. Under the impetus of AI technology, modern supply chains are manifesting key trends as follows:

√ End-to-end digital collaboration: real-time data sharing across the entire chain significantly enhances collaborative efficiency.

√ Predictive supply chains becomes main stream: AI forecasts demand variations, supplier risks, and logistics interruptions, effectuating a shift from "reactive responses" to "proactive prevention".

√ Resilient supply chain networks: AI-driven analysis is used to realize multi-source procurement, flexible manufacturing, and distributed warehousing, thereby thereby enhancing resilience against uncertainties.

√ Green sustainable supply chains: AI optimizes logistics, warehousing, and packaging to reduce carbon emissions, balancing economic and environmental benefits

√ Blockchain-Enabled Transparent Supply Chains: the integration of blockchain and AI ensures data immutability and end-to-end traceability, thereby facilitating the establishment of a trust mechanism.

As a pivotal national hub for advanced manufacturing, Chongqing is forging ahead with initiatives including the "33618" modern manufacturing cluster and the "Tiangong Huanxin" action plan for digital transformation of manufacturing industry. The supply chain, regarded as the "lifeline" of manufacturing, directly determines industrial competitiveness through its capacity of intelligence and collaboration. To align with the "AI + advanced manufacturing" paradigm and seize the high ground of development, Chongqing must elevate "reshaping the supply chain" to the core of strategy. By centering on "AI empowerment + data integration" as the guiding framework, the city should drive comprehensive transformation - from conceptual models to architectural frameworks, and from technological foundations to operational paradigms - thereby enhancing the entire industrial ecosystem's capability. This approach, which goes beyond merely increasing the number of enterprises, will effectively integrate local industrial and locational advantages, overcome bottlenecks, and gain a first-mover advantage in the new round of industrial competition.

Situation analysis: Chongqing's strengths and weaknesses in building an AI-driven smart supply chain

1. Strengths:

√ **Robust manufacturing foundation and industrial clusters**: Chongqing stands as a vital national production base for laptops, automobiles and motorcycles, boasting industrial clusters in electronics, automotive, equipment manufacturing and consumer goods industries. The "33618" framework itself forms an expansive internal supply chain market, especially in the forementioned sectors where the industrial chain is comprehensive. This provides abundant and diverse application scenarios and massive data resources for the application of AI technologies and the reshaping of supply chains.

√ **Distinctive hub status and logistics advantages**: As a key connection point between the "Belt and Road Initiative" (BRI) and the Yangtze River Economic Belt, Chongqing serves as the operational hub of the New International Land-Sea Trade Corridor (NILSTC). It is home to the largest inland port along the upper reaches of the Yangtze River, serves as the starting point for the China-Europe Railway Express (Chengdu-Chongqing), and boasts a comprehensive and intermodal logistics network spanning waterways, roads, air, and railways. Such advantages underscore the city's innate predisposition as a distinctive regional supply chain hub and for "reshaping the supply chain".

√ **Profound digital infrastructure**: Chongqing is recognized as a top-tier city for national industrial Internet identification and resolution and has accumulated vast amounts of industrial data, laying the foundation for supply chain digitalization.

2. Weaknesses:

√ **Disparities in overall capacity of supply chain intelligence**: While leading enterprises have a high degree of digitalization in their supply chains, a large number of SMEs lack basic informatization and networking capabilities. This leads to a prevalent phenomenon of "data silos" among enterprises and industrial chains. This hinders the integration and collaboration of data across the entire supply chain, making it difficult to achieve the holistic visualization and intelligent decision-making required for reshaping the supply chain.

√ **Insufficient supply chain capabilities**: Local supply chain services are primarily focused on traditional logistics and warehousing, and lack the capabilities to conduct overall optimization, implement measurable and controllable risk assessment, and develop comprehensive supply chain architectures and solutions.

√ **Lack of "chain master" platform**: There is no local giant or platform capable of integrating resources from the "33618" industrial cluster to provide AI-enabled supply chain scheduling and optimized services.

Suggestion: establishing a new paradigm for smart supply chain development with "One core, One network, and One ecosystem"

To address these weaknesses and leverage the strengths, Chongqing should establish "supply chain reshaping" as the core engine to comprehensively guide and enable the development of "AI + advanced manufacturing" , in order to establish a brand-new smart supply chain system centered around AI decision-making, industrial internet networking, and industrial ecosystem support.

1. "One core": Cultivating an AI-driven supply chain that enables collaborative decision-making in industries

Presently, Chongqing's manufacturing supply chain faces pain points such as "information silos", "lagging response" and "inadequate risk prediction". It urgently needs a core platform with a holistic perspective and intelligent decision-making capabilities to solve the problem of industrial chain collaboration.

√ It is recommended that Chongqing adheres to the principle of "government guidance, market leader-

ship, and multi-stakeholder collaboration" and prioritize the development of the "Industrial Supply Chain Collaboration and Innovation Center", with the aim of cultivating an "AI-powered Supply Chain Brain" that empowers the entirety of the industrial chain. At its core, this platform leverages AI and digital twin technologies to enable real-time simulation, scenario forecasting, risk pre-warning and autonomous decision-making for the comprehensive supply chain of key industries in Chongqing, so as to provide optimal logistics routes, inventory layouts, production schedules, and contingency arrangements for businesses and governmental entities.

√ In parallel, an industry cluster data hub, led by governmental initiatives alongside leading enterprises, telecommunications operators, and cloud service providers, can be established to foster a regional supply chain data platform tailored for key sectors like automotive and electronics. Unified standards are required for data collection, exchange, and security. With the data sovereignty of enterprises safeguarded, privacy-preserving computation technologies (e.g., 'data usability without visibility') can be employed to enable trusted sharing and cross-organizational analysis analysis of key data such as orders, inventory, production capacity, and logistics status, etc.

Case 1: Schneider Electric has globally deployed an end-to-end EcoStruxure™ platform, with its Supply Chain Control Tower serving as an exemplar of such an "AI Brain". Integrating data from hundreds of global suppliers, factories, and distribution centers, the platform applies AI and digital twin technologies to achieve real-time visibility, predictive analytics, and autonomous optimization across the global supply chain. In instances of port congestion or supplier disruption in a specific region, the system can promptly simulate alternative scenarios, adjust orders, production schedules and logistics routes automatically, mitigating impacts to the minimum. This exemplifies the overarching optimization capability that Chongqing ought to develop diligently. (For more details, please refer to Schneider Electric's 2019 thematic paper titled "Develop intelligent logistics to empower the sustainable development of Chongqing logistics channels")

2. "One Network": Establishing an "Industrial IoT Neural Network" for data interconnectivity, breaking down data barriers in the supply chain

The industrial Internet is the "vessel" for the flow of supply chain data, while the identification resolution system is the key to achieving "one item one code, and data interoperability". Currently, within the "33618" industrial cluster in Chongqing, many small and medium-sized suppliers are yet to be integrated into the industrial internet identification resolution system, resulting in data "disconnections" in the industrial chain, hampering the implementation of the "AI Supply Chain Brain". A dual approach of «mandatory requirements + incentive guidance» is recommended to quickly achieve a data interconnectivity network covering the entire industrial chain.

√ With focus on applications, vigorous promotion of the in-depth application of the industrial Internet

identification resolution system within the "33618" industrial cluster will enable cross-enterprise and cross-process data correlation and traceability. Advancing the application of the identification resolution system in Chongqing's key industrial clusters, including automotive, electronics and information technology, intelligent equipment, and biopharmaceuticals, ought to be prioritized. The goal is to motivate focal companies to integrate with the national top node in Chongqing. The focus is on three main categories: firstly, core components (e.g., automobile engines, electronic chips, and essential medical device components) to achieve full lifecycle traceability from production to disposal; secondly, production equipment (e.g., CNC machine tools, and industrial robots) to enable real-time monitoring and remote operation of equipment status through identification resolution; and thirdly, logistical units (e.g., containers, pallets, and parcels) to establish a seamless logistics data link from production facilities to warehouses to distributors, ensuring the "AI supply chain brain" has access to authentic and real-time data support.

√ Promote "one object, one code" , assigning a digital identity to each individual item, from raw materials and components to finished products, in order to facilitate comprehensive data traceability and transparent management throughout the chain and lifecycle

√ Build "digital supply chain twin platform" for key industries, involving high-precision dynamic mapping of the entire supply chain network, spanning from raw material supply and component distribution to production assembly and product distribution, rather than just focusing on the production line. This platform can be applied from mature scenarios such as demand forecasting, inventory optimization and logistics scheduling, expanding progressively to achieve a transition from "visualization" to "predictability, intervenability, and optimization", thereby providing a sandbox environment for simulation, risk pre-warning, and autonomous decision-making.

Case 2: Schneider's Putuo Factory in Shanghai, a well-established facility with a thirty-year history, has seen a surge in orders over the past four years due to the robust growth of the new energy market. The product variety has doubled during this period, presenting challenges in supply chain stability and responsiveness. To address this, the factory actively embraced digital transformation, integrating advanced technologies such as machine learning (ML), AI-generated content (AIGC), and automation with the Internet of Things (IoT). A comprehensive innovation was conducted across core processes including product R&D prototype design, flexible smart manufacturing, smart scheduling, predictive maintenance operations, and end-to-end supply chain collaboration. Such transformation spanned key functions such as R&D, procurement, production, and delivery. With the empowerment of AI, the factory achieved a 20% increase in production automation levels, a 67% reduction in order production delivery times, an 82% enhancement in output per capita, and a reduced time-to-market for new products from the previous 4-5 years to as short as 6 months, establishing a highly resilient and agile "end-to-end" operational model and setting a benchmark for the transformation and upgrade of traditional manufacturing industries. In October 2024, amid fierce global competition, the factory stood out and was named an "End-to-End Lighthouse

Factory" by the World Economic Forum (WEF). Looking ahead, the factory will continue to explore the deepening applications of AI in broader scenarios and is committed to leveraging its "lighthouse" experience to uplift the industrial chain.

3. "One Ecosystem": Building a diverse and symbiotic intelligent supply chain system to create a new type of "win-win chain" that balances efficiency, resilience and green initiatives

Schneider Electric believes[4] that to systematically enhance the resilience, efficiency, and competitiveness of regional supply chains, efforts must be made across three dimensions: technological innovation, management reform, and ecological collaboration, so as to further create economic and social value for industrial development.

√ First and foremost, **technological innovation** serves as the fundamental drive for enhancing supply chain efficiency and resilience. Whether at the production or logistics end, the application of new technologies such as AI can improve production efficiency and quality stability, enable real-time monitoring and precise forecasting, thereby reducing potential risks. Furthermore, through the establishment of a digitalized supply chain management system, companies can access real-time information from both upstream and downstream in the supply chain, so as to enable early warning of potential supply interruption risks and swiftly develop alternative solutions.

√ **Management reform** lays the foundation the upgrade of the supply chain, including strategic positioning, corporate mission, and empowerment of employees, etc. At the strategic level, a more customer-centric and regional based layout, reducing reliance on long-distance transportation and cross-border collaboration, is crucial for enhancing the supply chain resilience. At the corporate mission level, collaborating with upstream and downstream partners to facilitate green transformation and pursue sustainable development to tackle the pressing challenges of global climate. While in the aspect of employee empowerment, in the face of the development of digital technologies such as AI, empowering talent through continuous training mechanisms to enables the integration of human expertise and technology, thereby accelerating innovation and enhancing efficiency.

√ Ultimately, supply chain transformation cannot succeed without **ecological collaboration**. Faced with an increasingly complex global industrial ecosystem, supply chains have evolved into a multi-stakeholder and value-co-creating systems. Through ecological collaboration, enterprises within the chain can share experience and technology, jointly enhance management capabilities, and achieve greater efficiency and resource conservation. Concomitantly, focusing on the overall carbon

[4] *China News Service, July 14, 2025: "Schneider Electric's Yin Zheng: Moving Beyond 'Efficiency First' – Global Supply Chains Enter New Era Balancing Resilience, Efficiency, and Sustainability" https://www.chinanews.com.cn/cj/2025/07-14/10447593.shtml*

emissions of the supply chain, Enterprises across the supply chain can collaboratively develop carbon reduction strategies, mutually assisting each other to accelerate the green and low-carbon transformation of the entire chain.

Case 3: As an enterprise that has been consecutively listed in Gartner's "Global Supply Chains Top 25" for 10 years and ranked first for three consecutive years, Schneider Electric has pioneered a new paradigm of supply chain excellence built upon strategic foundation, and characterized by "triple innovation" in technology, management, and ecology.

Schneider Electric actively implements a multi-hub strategy. Through long-term planning, Schneider Electric has deployed diverse local supply chains across Europe, North America, China, and other regions to effectively meet market demands. In China, Schneider Electric's 30 factories and distribution centers, in collaboration with over 1,600 core Chinese suppliers, have achieved a local procurement rate of more than 90%, laying a solid foundation for building a robust, and efficient end-to-end green supply chain system.

In terms of technological innovation, Schneider Electric's supply chain, rooted in long-term lean management practices, drives actively the deep integration of advanced technologies like AI with production and operational scenarios to continually enhance efficiency and sustainability. The above-mentioned Putuo Factory serves as an excellent example.

In management and ecological innovation, Schneider Electric actively implement the sustainable development strategy, leveraging its own expertise and technology to propel upstream and downstrem partners towards collective efficiency and greening upgrades. It actively collaborates with partners across the value chain to construct an end-to-end value chain, committing to achieving net-zero carbon emissions by 2050. Moreover, through the establishment of a multi-faceted supplier data connectivity platform, Schneider Electric drives forward the green transformation of supply chain partners. Taking the Putuo Factory as an example, the company has achieved 100% data connectivity with all key suppliers, resulting in an 84% decrease in part defect rates and a reduction in production process wastage. In addition, it has initiated the "Zero Carbon Project" worldwide, aiming to assist the top 1,000 suppliers in reducing their carbon emissions by 50% by the end of 2025 by offering technical guidance, consulting services, and other means. As of the first quarter of 2025, this initiative has already delivered significant results, with suppliers achieving a remarkable 42% reduction in carbon emissions. These measures, facilitated by the sharing of digital practice experiences, drove the digital transformation of suppliers and fostered a cooperative ecosystem and partnership relations.

4. Talent and capability development

To actualize the aforementioned pathways and strategies, strategic reserves of talent and capabilities are indispensable.

√ **At the organizational level, enhancing digital skills across all employees:** From top-level execu-

tives to the grassroots, it is necessary to foster a "data-first" decision-making habit and a data-driven decision-making culture. This includes providing AI strategic thinking training for management, cultivating an understanding of data visualization systems, conducting AI tool usage training for frontline employees (such as intelligent quality inspection and data dashboard interpretation), appointing a Chief Data Officer (CDO), and establishing interdepartmental AI committees to drive data governance and process reengineering, introducing an "AI coach" system to offer real-time guidance to optimize operations, and more.

√ **At the industry level, developing interdisciplinary talents with composite capabilities:** The integration of manufacturing processes, data analysis, and AI technology talents is imperative for AI application in the supply chain. Encouraging collaborative efforts between universities and leading industrial players to establish joint laboratories or industry-education fusion projects can create a platform for focused research on the application of AI algorithms, IoT and blockchain in the realm of supply chain management, which is meant to cultivate local talent while implementing strategies such as innovation competitions and major talent programs to attract global expertise and high-level professionals, thereby establishing a solid talent foundation for the sustained development of the industry.

Case 4: Cultivating digital talents is a key aspect for Schneider Electric in building an efficient and green supply chain. To leverage technology effectively, the company's supply chain is fostering a proactive collaboration between people and technology by cultivating employees' business growth mindsets, fostering an expert culture, and promoting digital pioneers. Through training programs like "Digital Citizens" and "AI For All", it is anticipated that by the end of 2025, over 90% of the employees will possess proficient digital skills, becoming a "fresh force" in advancing the supply chain upgrading.

Conclusion

In conclusion, global competition in the field of "AI + advanced manufacturing" has elevated to a new level. Its essence lies in a contest between efficiency and resilience, with the holistic intelligence of supply chains being the ultimate determinant. For Chongqing, AI should not merely serve as a tool for production line optimization, but rather become a strategic pivot for reshaping the manufacturing value chain and enhancing regional competitiveness. By taking "reshaping the supply chain" as its core engine, leveraging AI to enhance the supply chain's overall perception, decision-making, and execution capabilities, and supported by robust strategic measures, Chongqing can enhance the resilience, efficiency, and competitiveness of its manufacturing clusters. This will enable Chongqing to shift from a "manufacturing base" to an "advanced manufacturing hub" and a "supply chain control center", thereby occupying a key position in the national and even global intelligent manufacturing landscape. This transformation is fraught with challenges, yet it holds broad prospects and is well worth Chongqing's firm investment and continuous exploration.

AI + Biopharma: Integrating pathways to drive innovative drug development and industrial upgrades in Chongqing

— Insights from MSD and AI applications in related industrial parks

Merck

1. Abstract

With the rapid advancement of artificial intelligence (AI) technologies, the global biopharmaceutical industry is undergoing profound transformation. As a key biopharma hub in China's central and western regions, Chongqing is actively promoting the integration of "AI + Biopharma" to establish itself as a leader in AI applications and foster high-quality industrial development. This study focuses on MSD's global headquarters (Kenilworth, New Jersey) and its Hangzhou production base, while drawing on experiences from Chongqing International Biopharma City and other industrial parks in smart manufacturing and innovation ecosystem development. It provides an in-depth analysis of the critical pathways through which AI empowers innovative drug development and industrial upgrades, offering policy recommendations and development strategies tailored to Chongqing's unique context to help build a world-class biopharma innovation ecosystem and achieve leapfrog industrial growth.

2. Introduction and Background

2.1 Global Trends in AI Integration with Biopharma

In recent years, artificial intelligence (AI) has rapidly advanced within the global biopharma industry, becoming a key driver for drug discovery, clinical trials, smart manufacturing, and precision medicine.Leading international companies such as MSD, Roche, and Pfizer have established AI-driven innovation platforms, leveraging machine learning, deep learning, and big data analytics to significantly enhance drug discovery efficiency, optimize clinical trial designs, enable smart manufacturing, and achieve targeted market promotion. The deep integration of AI not only accelerates the drug development cycle but also fosters collaborative innovation across the industry value chain and supports green, low-carbon transitions.

2.2 Current Status and Policy Environment of Chongqing's Biopharma Industry

As a major manufacturing and biopharma hub in China's central and western regions, Chongqing is actively

responding to the national strategy of "AI + Industry" by promoting the deep integration of digital technologies with the real economy. Chongqing has incorporated the biopharma industry into its "33618" modern manufacturing cluster system, aiming to build an industrial cluster worth hundreds of billions. Chongqing International Biopharma City, as a core industrial park, has attracted abundant innovative resources and high-quality enterprises, driving full-chain development in innovative drug research, clinical translation, industrialization, and market application.

The Chongqing municipal government has introduced multiple supportive policies, including the "Measures for Comprehensive Support of High-Quality Development of Innovative Drugs in Chongqing (Draft for Public Comment)," "Chongqing Medical Insurance Measures to Support Innovative Drug Development," and "Measures to Accelerate the Development of Chongqing's Biopharma Industry." These policies form a comprehensive framework covering R&D funding support, clinical trial capacity building, industrialization incentives, innovative medical insurance payment models, financial support, and talent recruitment, providing a solid foundation for high-quality industrial development.

2.3 Research Objectives and Significance

MSD aims to leverage AI application practices from its global headquarters (Kenilworth, New Jersey) and Hangzhou production base to deeply analyze the critical pathways through which AI empowers innovative drug development and industrial upgrades. The study explores the current status and challenges of Chongqing's biopharma industry's smart manufacturing and innovation ecosystem development, proposing actionable policy recommendations and development strategies to help Chongqing establish itself as a world-class hub for AI applications, achieve leapfrog growth in the biopharma industry, and enhance international competitiveness.

3. Analysis of MSD's Global and Related Industrial Park AI Practices

As a global leader in biopharma, MSD has fully integrated artificial intelligence (AI) into innovative drug development and smart manufacturing, creating a comprehensive digital ecosystem spanning drug discovery, clinical trials, smart manufacturing, and market promotion. Its AI practices demonstrate unique advantages and significant outcomes across key areas, including:

- **End-to-End AI Empowerment**

MSD has achieved deep AI integration across the entire process, from drug development and clinical trials to smart manufacturing and market promotion, building a unified data platform to support intelligent decision-making and resource optimization.

- **Intelligent Drug Discovery**

Machine learning and deep learning are used to precisely identify drug targets, rapidly screen and optimize

candidate molecules, significantly shortening early-stage development cycles and improving efficiency and success rates.

- **Optimized Clinical Trials**

AI assists in patient screening and trial design, enhancing clinical trial success rates, reducing costs, and shortening trial durations.

- **Smart Manufacturing Excellence**

At the Kenilworth headquarters smart factory, AI-driven scheduling and process simulation have boosted production efficiency by approximately 15%; predictive maintenance has reduced equipment failure rates by 20% and maintenance costs by 25%; AI-powered visual inspection enables real-time quality monitoring, increasing product pass rates by 5%; green manufacturing initiatives have reduced energy consumption by 10%, advancing low-carbon sustainability.

- **Digital Transformation at Hangzhou Facility**

MSD's Hangzhou factory has fully embraced digital and smart manufacturing transformation. The facility integrates Manufacturing Execution Systems (MES), Enterprise Resource Planning (ERP), and Quality Management Systems to enable real-time production data collection and analysis, ensuring transparent and controllable operations. Automated production lines with robotics and AI visual inspection technology enhance production efficiency and product quality while minimizing human error. Predictive maintenance using IoT sensors and AI algorithms significantly reduces equipment failure rates and downtime. The application of digital twin technology further improves production flexibility and responsiveness. This digital transformation not only boosts production efficiency and product pass rates but also promotes green, low-carbon manufacturing, showcasing MSD's leadership in smart manufacturing.

- **Global Collaborative Network**

Leveraging collaboration between its global headquarters and Chinese facilities, MSD rapidly replicates and scales advanced practices, enhancing regional competitiveness.

Key Areas	AI Application Highlights	Specific Outcomes and Advantages
Drug Discovery	Machine learning for precise target identification and molecule screening	Shortened early-stage development cycles, improved efficiency and success rates Precise targeting, rapid screening
Clinical Trials	AI-assisted patient screening and trial design	Enhanced success rates, reduced costs, shortened durations, intelligent clinical trials, faster timelines

Smart Manufacturing (Kenilworth Headquarters)	AI-driven scheduling and process simulation, predictive maintenance, AI visual quality monitoring, green manufacturing	Production efficiency increased by 15%, failure rates reduced by 20%, pass rates improved by 5%, energy consumption lowered by 10%
Smart Manufacturing (Hangzhou Facility)	Monitoring production processes, automating quality inspections, and enabling intelligent equipment maintenance	Digital transformation to ensure production stability and product quality
Global Collaboration	Rapid replication of expertise between headquarters and the China base	Enhancing regional competitiveness, fostering global collaboration, and accelerating knowledge transfer

4.Current state of intelligent integration in the biopharmaceutical industry under Chongqing's "AI Application Hub" strategy

Chongqing is actively advancing its "AI Application Hub" strategy, promoting deep integration of artificial intelligence with the biopharmaceutical industry to establish a development framework centered on intelligent R&D, smart manufacturing, and intelligent services. Particularly in the context of rapid growth in the smart medical equipment sector, efforts are being made to drive the convergence of medical and engineering fields and the deep application of AI, resulting in innovative products such as digital surgical navigation systems and intelligent medical devices, significantly enhancing the competitiveness of the industrial chain.

During recent inspections, municipal leaders emphasized the importance of adhering to the principles of "horizontal integration and innovation, vertical chain extension" to strengthen the industrial chain and upgrade smart manufacturing, thereby promoting high-quality industrial development. This strategic guidance has provided a clear direction for the integration of AI and the biopharmaceutical industry in Chongqing, reflecting the municipal government's ongoing focus and strategic support for the biomedical sector.

Based on this, Chongqing is actively planning in areas such as intelligent R&D, smart manufacturing, intelligent services, and policy ecosystems to drive the deep integration of AI technology with the biopharmaceutical industry, as demonstrated in the following aspects:

- **Intelligent R&D Applications**

Leveraging AI technology to enhance the efficiency of innovative drug development, applying big data and machine learning in drug target discovery, molecular design, and clinical trials to shorten development cycles and improve success rates.

- **Smart Manufacturing Practices**

Promoting the construction of intelligent factories, utilizing AI for production process monitoring, predictive equipment maintenance, and automated quality inspections to boost production efficiency and product quality while advancing green and low-carbon manufacturing.

- **Innovative Intelligent Services**

Employing AI to optimize healthcare service workflows, enabling intelligent diagnostics, personalized treatments, and health management to improve service quality and patient experience.

- **Policy Support and Ecosystem Development**

Chongqing has introduced multiple policies to support the integration of AI with the biopharmaceutical industry, including financial incentives, talent acquisition, data sharing, and industrial collaboration, fostering a robust innovation ecosystem.

Currently, Chongqing has achieved initial success in empowering the biopharmaceutical sector with AI, but challenges such as insufficient data standardization, talent shortages, and limited depth of technology application remain. Moving forward, it is essential to strengthen top-level planning, deepen collaboration among industry, academia, and research institutions, and promote the widespread application of AI across the entire biopharmaceutical value chain to drive high-quality industrial development.

5. Key technological pathways for AI-driven innovation in drug development and industrial upgrading in Chongqing

Chongqing is at a critical juncture in the rapid development of its biopharmaceutical industry, where the deep integration of artificial intelligence is unlocking unprecedented opportunities for innovative drug development and industrial upgrading. Drawing on MSD's globally leading practices and advanced methodologies from international consulting firms, we have distilled key technological pathways to accelerate Chongqing's intelligent transformation in the innovative drug industry, enhancing R&D efficiency, optimizing production processes, and advancing precision medicine. MSD global practices

- **Intelligent Drug Development**

Leveraging machine learning and deep learning technologies to accurately identify drug targets and optimize molecular structures, significantly reducing development timelines. MSD's global practices indicate that AI-assisted design can shorten early-stage development by approximately 30%, while enhancing the quality and success rate of candidate drugs.

- **Smart Clinical Trials**

Harnessing big data and AI to optimize patient selection and trial design, improving the efficiency and success rates of clinical trials. International experience shows that intelligent clinical trial platforms can cut patient recruitment time by 50% and compress trial initiation cycles to within 25 weeks.

- **Intelligent Manufacturing and Green Production**

Advancing smart factory construction by applying AI for production scheduling, predictive maintenance of equipment, and quality control, thereby boosting production efficiency and product consistency. MSD's Hangzhou facility demonstrates that intelligent manufacturing can increase production efficiency by 15%, reduce equipment failure rates by 20%, and simultaneously drive green, low-carbon transformation.

- **Intelligent Clinical Data Analysis and Real-World Data Utilization**

Developing multidimensional data platforms to support cross-institutional data sharing and AI model training, utilizing real-world data to assist in evaluating drug safety and efficacy, and advancing precision medicine.

- **Data Governance and Security Assurance**

Establishing unified data standards and security frameworks to ensure compliant data sharing and privacy protection, unlocking data value while safeguarding patient rights.

- **Chongqing-Specific AI Application Scenario Design**

Tailored to Chongqing's context, designing an intelligent clinical trial collaboration platform, a fast-track approval support system for innovative drugs, and an industrial brain to drive smart manufacturing upgrades in the International Biocity, enabling digital collaboration and intelligent decision-making across research, production, and supply chains.

6.Practical Recommendations for Chongqing Based on Insights from Global Leading Enterprises and Industrial Parks

Chongqing's biopharmaceutical industry is at a critical juncture of rapid growth, with the deep integration of artificial intelligence technologies presenting unprecedented opportunities for industrial upgrading. Drawing on the practices of MSD and internationally advanced industrial parks, and adopting a global perspective, we propose the following key insights and strategic recommendations to help Chongqing establish a world-class AI-driven biopharmaceutical innovation ecosystem.

First, end-to-end intelligent transformation is the inevitable path for future development. From drug discov-

ery and clinical trials to smart manufacturing and market promotion, AI-driven digital processes will significantly enhance industrial efficiency and competitiveness. Chongqing should build an intelligent ecosystem encompassing research and development, production, distribution, and services, fostering collaborative innovation across the industry value chain to create a highly interconnected industrial cluster.

Second, data governance and sharing form the solid foundation for AI applications. High-quality, standardized data is a prerequisite for AI to deliver its full potential. Chongqing needs to accelerate the establishment of unified data standards and secure sharing mechanisms, promoting interconnectivity across institutions and sectors. This will ensure data privacy and compliance, unlock data value, and drive innovation in drug development and precision medicine.

In terms of talent, cultivating and attracting interdisciplinary professionals skilled in both AI and biopharmaceuticals is a critical driving force. Chongqing should establish a multi-tiered talent development system, attract top international talent, deepen industry-academia-research collaboration, and leverage global innovation resources to enhance local innovation capabilities, positioning itself as a talent hub.

Additionally, green intelligent manufacturing supports sustainable industrial development. By learning from MSD's green manufacturing practices, Chongqing can promote the deep integration of smart manufacturing and eco-friendly processes, achieving energy conservation, emission reduction, and resource recycling. This will create a low-carbon, environmentally friendly biopharmaceutical value chain, enhancing the industry's overall competitiveness.

On the policy front, a dynamic optimization of support systems is needed to stimulate innovation. The government should continuously refine policies supporting innovative drug development, industrialization, and market application. This includes strengthening financial investment and services, streamlining approval processes, and accelerating the market launch and insurance inclusion of innovative drugs, thereby fostering a favorable business environment.

Finally, advancing the intelligent transformation of biopharmaceutical industrial parks is a key lever for enhancing regional competitiveness. Chongqing should elevate the professional operational standards of key parks like the Chongqing International Bio-City, creating a world-class innovation ecosystem. By building an "industrial brain + future factory," the city can achieve digital collaboration and intelligent decision-making across R&D, production, and supply chains, driving industrial clustering and coordinated development, and setting a benchmark for the intelligent transformation of Chongqing's biopharmaceutical industry.

In summary, Chongqing should adopt a global perspective, leverage its unique strengths, and coordinate efforts in technological innovation, talent development, data governance, green manufacturing, and policy support. The goal is to build an AI-powered biopharmaceutical industry ecosystem with international competitiveness, driving high-quality industrial development.

7.Conclusion

Artificial intelligence technology is emerging as the core driving force behind global innovation in the biopharmaceutical industry. Chongqing possesses a solid industrial foundation and favorable policy environment, actively promoting the deep integration of "AI + biopharmaceuticals," and holds unique advantages and potential for achieving leapfrog development. By drawing on advanced AI application practices from MSD's global headquarters and its Hangzhou production base and integrating experiences from Chongqing International BioCity in smart manufacturing and innovation ecosystem development, Chongqing can significantly enhance the efficiency of innovative drug research and development, elevate intelligent manufacturing capabilities, and modernize the industrial chain, thereby driving high-quality industrial growth.

Chongqing should focus on key AI-enabled technological pathways, advancing intelligent drug development, smart clinical trials, intelligent manufacturing and green production, intelligent clinical data analysis, and the promotion of precision medicine. It should establish open and shared innovation platforms, strengthen deep integration across industry, academia, research, and healthcare, and foster a collaborative innovation ecosystem. Additionally, Chongqing should refine policy support and financial assistance systems, enhance talent cultivation and international cooperation, improve data governance and security mechanisms, and upgrade the intelligence of industrial parks, aiming to create a world-class hub for AI applications and a biopharmaceutical innovation ecosystem.

Looking ahead, with the empowerment of AI technology, Chongqing is poised to become a key biopharmaceutical innovation hub and a model zone for intelligent manufacturing in China and even globally. This will enable the industry to achieve leapfrog development, enhance international competitiveness, and contribute to establishing a globally influential new high ground for the biopharmaceutical sector.

Potential of AI Application in Non-Manufacturing Sectors to Address Labor Shortages

~ Leveraging Issue Resolution as a Catalyst for Collaborative Opportunities between Japan and Chongqing, China ~

Mizuho Financial Group, Inc.

Chapter 1. Current Status of Labor Shortages in Japanese Industries

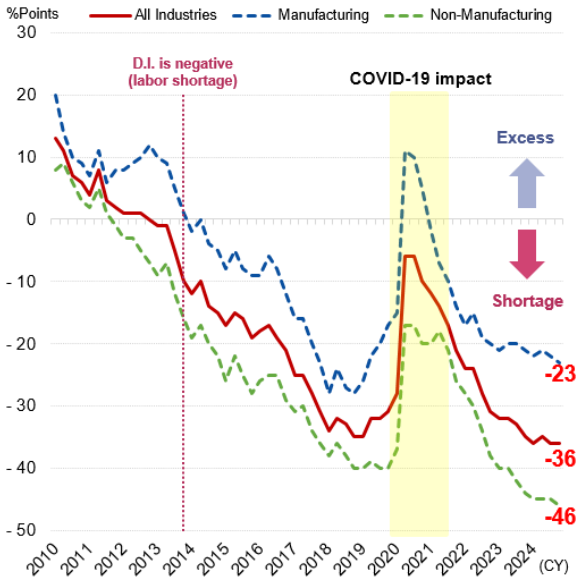
In Japan, where declining birthrates and an aging population are intensifying, “labor shortages” have long been an issue across various industries, but they appear to have intensified recently.

To confirm the severity of these labor shortages, we examine the trends in the Employment Conditions Diffusion Index (D.I.). This indicator represents the employment adequacy based on corporate survey results, with larger negative values indicating “stronger labor shortage sentiment among companies.”

The Employment Conditions D.I. has been consistently deteriorating since 2010, and although it temporarily improved during the economic stagnation caused by the COVID-19 pandemic in 2020, it has recently worsened beyond pre-pandemic levels (Chart 1).

When examined by industry sector, the shortages are particularly severe in non-manufacturing industries (Chart 2). The underlying factor is a structural problem where labor-intensive non-manufacturing sectors have more difficulty in improving per-capita productivity compared to manufacturing industries.

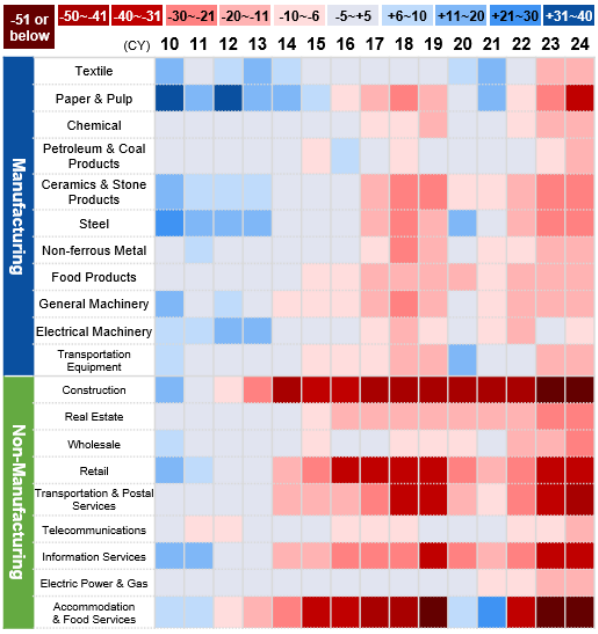
(Chart 1) Trends in Employment Conditions D.I. (2010-2024)



Note: Average of March, June, September, and December values for each year

Source: Compiled by Mizuho Bank Industry Research Department based on Bank of Japan "Tankan (Short-Term Economic Survey of Enterprises in Japan)"

(Chart 2) Employment Conditions D.I. Trends by Industry Sector (2010-2024)

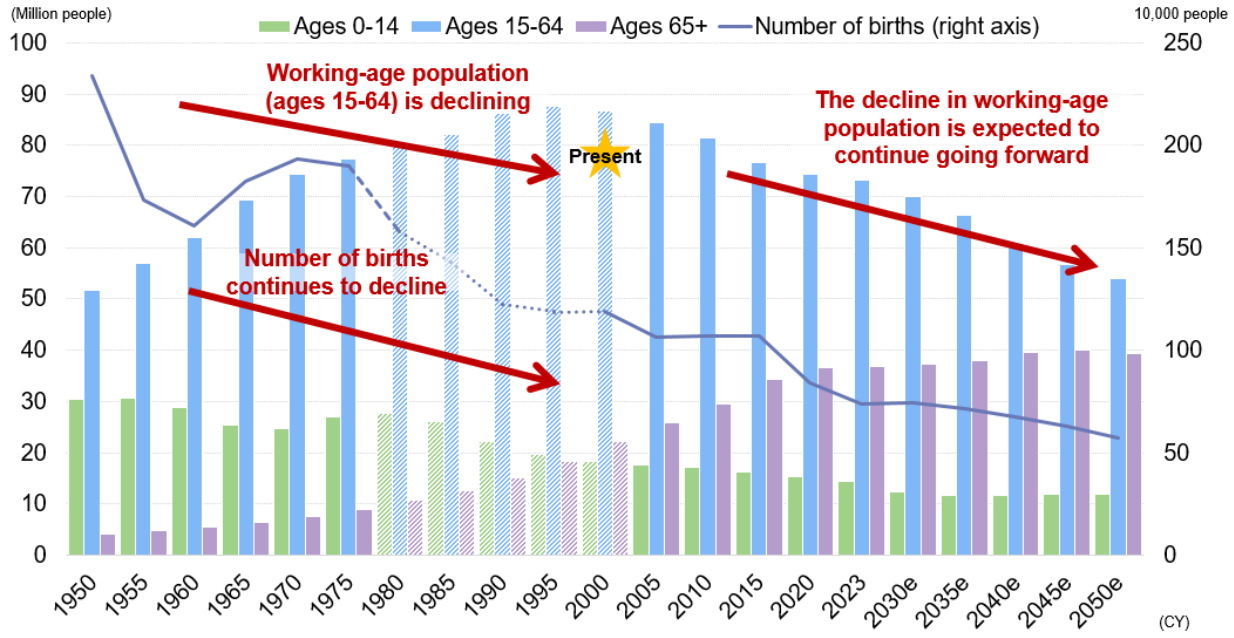


Note: Average of March, June, September, and December values for each year

Source: Compiled by Mizuho Bank Industry Research Department based on Bank of Japan "Tankan (Short-Term Economic Survey of Enterprises in Japan)"

A key factor contributing to the intensifying labor shortages in Japan is the decline in the working-age population (ages 15-64), which constitutes the primary workforce (Chart 3). Similarly, when considering future prospects, how this working-age population will trend going forward is crucial, and it is expected to continue declining. The increase or decrease in the working-age population depends on the number of births approximately 20 years earlier, when the generation entering the workforce around age 20 was born. The underlying factor is that these birth numbers have also been continuously declining since 2000.

(Chart 3) Japan's Population Trends by Age Group (Actual: 2000-Present, Forecast: -2050)



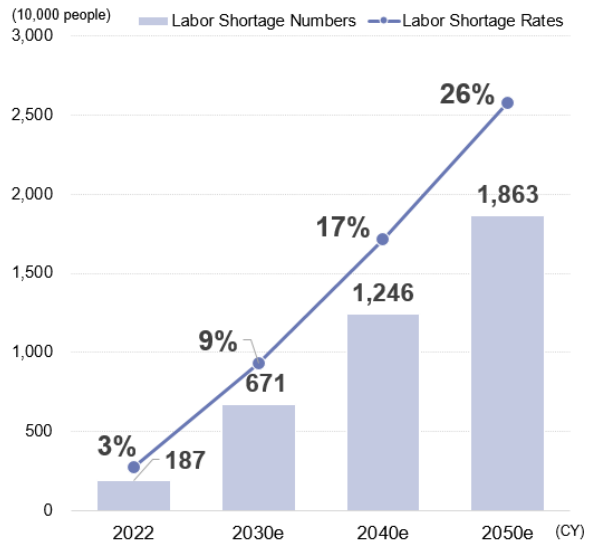
Note: Birth rates from 2030 onwards are forecast values (medium fertility variant) from the National Institute of Population and Social Security Research

Source: Compiled by Mizuho Bank Industry Research Department based on United Nations and National Institute of Population and Social Security Research data

In this report, we calculated projected labor shortage figures for Japan through 2050. Labor shortages refer to the gap between labor demand and labor supply – specifically, the number of positions that companies wish to fill but are unable to recruit for due to a lack of available workers. In our calculations, labor demand was computed under the assumption that real GDP continues to grow at an annual rate of 0.5%, while labor supply was calculated considering the aforementioned demographic outlook and assuming that labor force participation rates across generations remain unchanged from current levels.

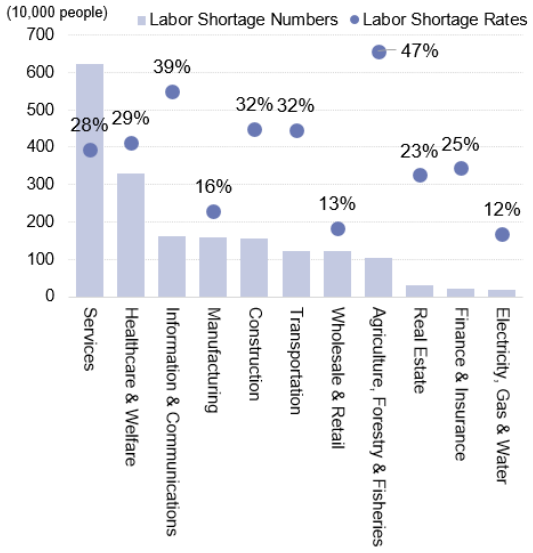
The results indicate that the labor shortages are projected to expand to 18 million workers by 2050. The primary factor behind this increase is the decline in the working-age population. This figure of 18 million represents approximately 26% of total labor demand. To describe this situation simply, this is equivalent to a nationwide situation where work that should ideally be performed by four people must be handled by only three. Among industries, non-manufacturing sectors are expected to experience particularly severe labor shortages, as many of these sectors are naturally labor-intensive and many face especially serious workforce aging challenges.

(Chart 4) Projected Trends in Labor Shortage Numbers and Labor Shortage Rates



Source: Compiled by Mizuho Bank Industry Research Department

(Chart 5) Labor Shortage Numbers and Labor Shortage Rates by Industry Sector (As of 2050)



Source: Compiled by Mizuho Bank Industry Research Department

If no effective measures are taken to address this situation, there is concern that the provision of products and services we take for granted in our daily lives could be disrupted. How can we avoid this bleak future? Chapter 2 examines solutions to address the labor shortages.

Chapter 2. Measures to Address Labor Shortages and Expectations for AI and Robotics

Solutions to address these labor shortages that are expected to further intensify can be broadly classified into four categories: “workplace improvement” (process reviews, layout changes, etc.), “workforce enhancement” (raising labor force participation rates for women and elderly workers, expanding acceptance of foreign workers), “robotics utilization,” and “AI application and digitalization.” To what extent can each of these solutions help address the labor shortage?

First, “workplace improvement” has been actively pursued in both manufacturing and non-manufacturing industries as Japan’s traditional strength, exemplified by “Toyota-style Kaizen.” However, this also means that room for further efficiency gains is limited, and in the context of rapid population decline going forward, it is anticipated that “workplace improvement” alone cannot resolve labor shortages.

Next, “workforce enhancement” can be considered. In terms of promoting workforce participation by women and the elderly, Japan has actively pursued this through enforcement of the “Act on Equal Opportunity and Treat-

ment between Men and Women in Employment" and amendments to the "Act on Stabilization of Employment of Elderly Persons," thereby demonstrating a more proactive approach than other developed countries. However, room for raising labor force participation rates is considered limited. While the acceptance of foreign workers is also expected in the future, similar labor shortages are emerging across other East Asian countries and as such competition to acquire talent is expected to intensify. It is also considered unrealistic to place excessive expectations on expanding the acceptance of foreign workers.

This brings expectations to focus on resolving labor shortages through "AI application and digitalization" and "robotics utilization." Both are initiatives that also contribute to productivity improvement, a long-standing challenge for Japan, and are considered to be essential elements for growth by resolving labor shortages.

When we speak of "robotics utilization," rather than robots that simply perform basic tasks in response to human instructions, AI robots that act autonomously hold great promise for the future. For both "AI application and digitalization" and "robotics utilization," the development of AI technology applicable to each industry becomes the key point. Therefore, Chapter 3 examines the potential of "industry-specific AI," which holds particular promise for addressing labor shortages.

Chapter 3. Prospects for Industry-Specific AI to Address Labor Shortages

As labor shortages intensify across many industries in the future, the development of industry-specific AI capable of handling specialized tasks within each industry is anticipated. Unlike general-purpose AI that can be utilized across all industries, industry-specific AI is developed with the premise of being utilized within specific industries after aggregating data unique to those industries.

This industry-specific AI contributes not only to replacing cognitive tasks such as administrative work, but also to substituting for physical tasks involving bodily labor. For example, if AI robots specialized for care services could be developed, they could potentially replace physically demanding tasks such as patient lifting and transfers and walking assistance for care recipients.

A key challenge in utilizing industry-specific AI is how to aggregate closed data (proprietary data). General-purpose AI such as ChatGPT, which is currently gaining widespread use, primarily utilizes open data that is publicly available on the Internet. In contrast, developing industry-specific AI requires utilizing closed data held internally by various companies within the relevant industries. Since AI performance generally depends on the volume of training data, scaling up closed data becomes crucial for improving performance. To achieve this, it would be desirable to centralize industry domain knowledge through data integration across corporate boundaries. However, data integration faces challenges from the perspectives of regulations, compliance, and competitive dynamics between companies.

This creates expectations for federated learning technology. Federated learning technology enables the con-

struction of AI models in situations where data is distributed across organizations and companies, and its utilization is expected to enable the scaling of data.

Industry-specific AI could first enable the replacement of administrative work requiring specialized knowledge in each industry. In terms of robots, current applications are primarily concentrated in service areas such as food service and cleaning, but, going forward, the scope of application is expected to expand to areas requiring more complex movements such as construction and care.

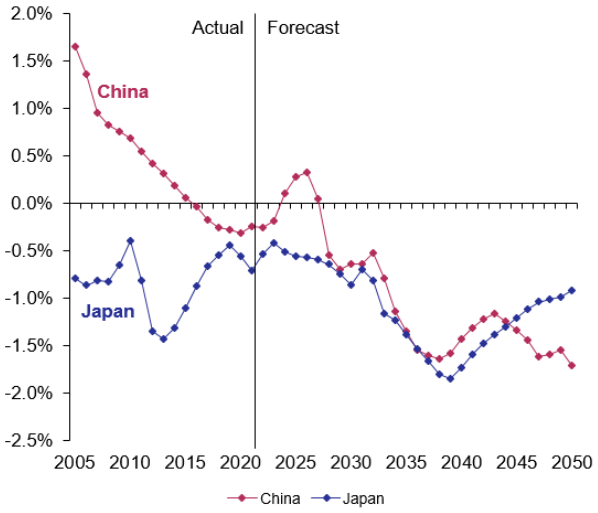
Chapter 4 discusses the possibility of Japan and China collaborating to resolve labor shortage issues through the utilization of this industry-specific AI.

Chapter 4．Potential for Addressing Labor Shortages through Japan-China Collaboration ~Collaboration in the Care Sector~

Up to this point, we have discussed how expectations are growing for AI and AI robots as solutions premised on the intensifying labor shortages in Japan. However, it is undeniable that China also faces similar concerns about future labor shortages. According to data published by the United Nations, China's working-age population, which constitutes the primary workforce, has been declining since 2017, and the rate of decline is projected to further increase through 2050 (Chart 6).

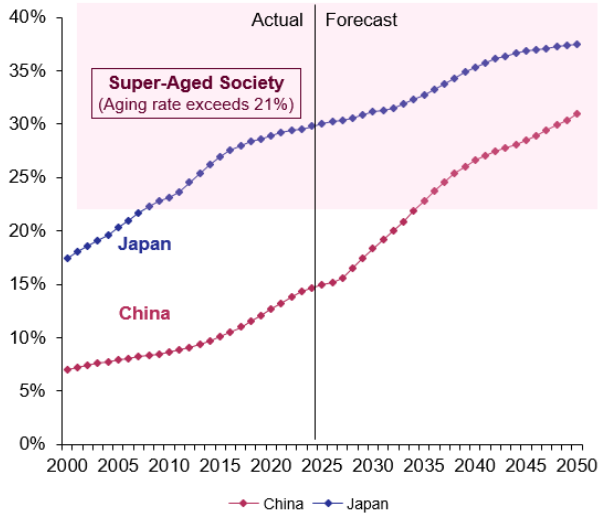
Additionally, population aging is also a serious challenge for both Japan and China. Generally, when the aging rate (the proportion of the population aged 65 and above) exceeds 21%, it is referred to as a "super-aged society." While Japan entered a super-aged society in 2007, China is expected to enter a super-aged society in 2034, with the aging rate projected to continue rising thereafter (Chart 7).

(Chart 6) Working-Age Population Growth Rate in China and Japan (2005-2050)



Source: Compiled by Mizuho Bank Industry Research Department based on United Nations data

(Chart 7) Aging Rate in China and Japan (2000-2050)



Source: Compiled by Mizuho Bank Industry Research Department based on United Nations data

With the decline of the working-age population, which constitutes the primary workforce, and rapid population aging, what is particularly concerning for both Japan and China is the labor shortages in the care sector, where demand is expected to increase due to aging. In Japan, labor shortages in the care sector are already being discussed as the number of individuals requiring support and certified as requiring care increases alongside population aging. Going forward, there are concerns that similar challenges may become social issues in China as well. Therefore, it is expected that Japan and China, which share common challenges, will leverage their respective strengths to resolve labor shortage issues in this sector for both countries.

Having entered a super-aged society ahead of other countries, Japan has built up considerable expertise in "care services." In 2000, the Long-Term Care Insurance System was introduced with the purpose of having society as a whole support elderly care. Through the operation of this Long-Term Care Insurance System, Japan has accumulated know-how in various operations related to care services, including the development of individualized care plans and physical care such as patient lifting and transfers. Additionally, Japan has strengths in care services that are high quality and variety rich. Specific examples of care services include serviced housing for the elderly, nursing homes, hospice-type housing, day services, and home care services. Because Japan is leading in many aspects of the care sector, international interest in Japan is also high.

Recently, there have been movements by Japanese companies seeking to enter China's care sector. For example, Japan's Panasonic Holdings, together with Yada International Holdings, which operates care, healthcare, and tourism businesses in China, developed an elderly care township called "Yada-Panasonic Community" in Yixing City, Jiangsu Province, China, by creating a residential area with serviced housing for the elderly. The apartments

built in this district incorporate Japan's accumulated know-how in the care sector. These include lighting systems with automatic brightness adjustment functions in bedrooms, smart toilets that can monitor health conditions by measuring urine composition and blood pressure while seated, as well as carefully designed air conditioning equipment and spatial layouts.

Smart care utilizing various technologies, such as the "Yada-Panasonic Community," can achieve advanced care and health monitoring while reducing the burden and stress on elderly residents and simultaneously achieving operational efficiency with reduced staffing. For example, by having care recipients in nursing homes wear wearable devices and embedding sensors in toilets, floors, and bedding, it becomes possible to monitor various vital signs of care recipients in real time. This enables automatic alerts that immediately notify care staff when any abnormalities occur, thereby creating a safer and more robust care system.

On the other hand, China has strengths in developing high-performance robots and manufacturing them at low cost through mass production, supported by substantial financial resources and technological capabilities. Currently, there have been remarkable developments in humanoid robots and quadruped robots. For example, humanoid robots developed by robot manufacturers such as UBTECH Robotics and Unitree Robotics have actually begun to partially replace human labor in manufacturing facilities and other workplaces. In current care settings, various technology implementations can be observed, such as using power assist suits to help with patient lifting and transfers for care recipients, and electric beds to assist care recipients in getting out of bed. At present, these technologies merely reduce the burden of manual tasks through mechanical assistance, and human personnel in care settings cannot be completely replaced. However, going forward, although there are issues of social acceptability, the advancement of the various robots mentioned above will likely make it realistic to partially replace human personnel in care settings. In areas such as bathing assistance and toileting assistance, some even advocate for robot assistance over human assistance to better preserve the dignity of care recipients.

To address the increasingly severe labor shortages in the care sector that accompanies the progression of declining birthrates and aging populations, two objectives must be achieved: (1) reducing the number of care recipients, and (2) reducing the human resources required for care recipients. The solution to these challenges lies in combining industry-specific AI with the smart care and robotics discussed above.

(1) First, smart senior housing with services for the elderly can reduce the likelihood of individuals requiring care by monitoring their health conditions on a regular basis and minimizing the occurrence of injuries, illnesses, and stress. Alternatively, even when care becomes necessary, smart care can provide care to prevent their care needs from increasing. Through these measures, a reduction in the number of care recipients can be achieved. Going forward, by combining this with industry-specific AI specialized in care, further productivity improvements can be expected. Specifically, if AI capable of automatically generating appropriate care services for each individual by understanding information about individual care recipients could be developed, then further efficiency improvements and service enhancement would become possible.

(2) Regarding measures to “reduce human resources required for care recipients,” no matter how extensively technology-enabled senior housing for the elderly is utilized, it is impossible to completely eliminate people who require care, and even using power assist suits and electric beds to reduce care burdens has limitations in terms of the amount of labor that can be saved. Therefore, human caregivers in the care industry will still be necessary, but it is possible to replace part of this workforce with robots. Currently, the development of humanoid robots is also advancing in China, and when replacing multiple different tasks performed by humans, such as transfer assistance and walking assistance, the utilization of humanoid robots would be most suitable.

Going forward, by having AI learn operational data from real-world care environments and embedding this in humanoid robots, the development of industry-specific AI humanoid robots capable of handling various tasks in care can be expected.

Through the utilization of technologies where Japan and China each possess strengths, and through the application of industry-specific AI, if the objectives of (1) reducing the number of care recipients and (2) reducing human resources required for care recipients can be achieved, then this could lead to significant relief from the “labor shortages in the care sector accompanying declining birthrates and aging populations” that both Japan and China face. By deploying smart care solutions such as technology-enabled senior housing for the elderly and care robots to countries around the world that are about to face declining birthrates and aging populations, it will be possible to envision a “successful model for solving social challenges” originating from East Asia.

There are already encouraging signs of collaborative potential, particularly with Chongqing, where JETRO (Japan External Trade Organization) has organized exchanges titled “Japan-China Elderly Industry Exchange Meetings” in both Chongqing and Chengdu. Going forward, it is possible for Japanese companies to collaborate with Chongqing’s enterprises and government to jointly address social challenges and pursue further growth.

With regard to the challenging issue of care workforce shortages accompanying declining birthrates and aging populations that countries around the world will eventually face, or are already facing, there is potential for a bright future in which Japan and China will lead other nations in providing solutions to the world and achieving their resolution.

Empowering Citrus Cultivation in Chongqing with AI and Digital Technologies

BASF

I. Introduction

Citrus is one of China's most important fruit crops. In 2022, the national output exceeded 45 million tons, accounting for 21.3% of the country's total fruit production. In Chongqing, citrus is a pillar of the agricultural economy, with a planting area of over 2 million mu (approximately 133,333 hectares). The late-ripening citrus belt in the Three Gorges Reservoir Area supplies 80% of China's winter fresh citrus fruit and serves as Asia's largest orange juice processing base and the world's largest virus-free seedling propagation center.

However, the citrus cultivation industry in Chongqing faces serious challenges. First, resource waste is significant: local pesticide application in citrus cultivation reaches 175 kg/ha, 2.5 times the global average, while excessive fertilizer use has led to soil degradation. Second, yield and quality are under pressure: frequent climate anomalies and severe pest and disease outbreaks in recent years have not only reduced citrus yield and quality but also directly impacted the income of many growers.

Against this backdrop, digital transformation has become a critical pathway for the industry to overcome challenges and achieve high-quality development. Leveraging its globally leading agricultural expertise, BASF proposes reshaping Chongqing's citrus industry chain through "AI+Digital Technologies", creating a closed-loop ecosystem where "farmers grow high-quality fruit with confidence, and high-quality fruit receives fair pricing".

II. BASF Contribution to China's Citrus Cultivation

BASF's global experience in agricultural solutions dates back to the establishment of the Limburgerhof Agricultural Research Station in 1914, which laid a solid foundation for its agricultural R&D. In 2018, strategic acquisitions enabled BASF to expand into seeds and digital agriculture, forming an integrated "Seeds-Crop Protection-Digital" solution portfolio.

In digital agriculture, BASF's brand Xarvio® serves over 4 million farmers and agricultural advisors across more than 100 countries, covering crops such as rice, wheat, barley, grapes, and potatoes. This digital solution enables precise crop management through real-time monitoring of physiological status, biotic stress, and environmental parameters, helping increase yields while reducing pesticide input, water consumption, and carbon footprint—contributing to sustainable agriculture.

BASF's agricultural services in China began in 1924 with the export of the first 50 tons of ammonium sulfate fertilizer, which contributed to advances in rice cultivation technology in Asia. In 1929, BASF set up an agricultural advisory office in Tianjin, providing localized technical support for wheat and cotton in northern China and pioneering on-the-ground services by multinational agricultural companies in the country. Entering the 21st century, BASF accelerated its strategic presence in China: in 2013, its AgCelence® technology received the first plant health registration from the Ministry of Agriculture, and it remains the only foreign company with this certification. From 2013 to 2018, BASF launched over 20 new agrochemical products covering rice, fruits, vegetables, and cash crops. By 2024, the company had served more than 500,000 Chinese farmers, with technologies applied on over 10 million mu (approximately 666,667 hectares), and China's contribution to the group's agricultural revenue increased to 13%.

In the citrus sector, BASF has established a comprehensive technology-enabled system spanning the entire industry chain. In major production areas like Hunan and Hubei, BASF promotes high-quality solutions such as Cabrio® Top (containing pyraclostrobin and metiram), PinGan (pyraclostrobin and mancozeb), and ShanChang (mancozeb and benzovindiflupyr + pyraclostrobin) to control challenging diseases like citrus black spot. These products not only effectively manage diseases but also enhance plant health and tree vigor using AgCelence® technology. In Guangxi, areas severely affected by Huanglongbing (HLB) implement a "Three-Axe Strategy', using virus-free seedlings, psyllid control, and removal of infected trees—along with the "Tameiguoxiang" program. This program features six flagship BASF products including Cabrio® Top, Melyra, Allegro, Wangqiu Micronutrients, Wangqiu Amino Acids, and Wangqiu Seaweed Extract. Combined with drone application technology, the program reduces pesticide use by 30% and focuses on improving fruit quality to help growers produce premium citrus.

III. Upgrading Chongqing's Citrus Cultivation with AI and Digital Technologies

To advance the digital transformation of citrus cultivation in Chongqing, BASF proposes investing in a "Citrus Farming Decision Platform" for intelligent sensing, early warning, and decision-making throughout the cultivation process. The platform will provide precise, visualized, and smart support, enabling digital management across the entire growth cycle and industry chain. This will help reduce agrochemical use, optimize irrigation, and ultimately contribute to sustainable development.

The platform consists of five modules that can operate independently or function together as an integrated system.

1. Crop Growth Prediction Subsystem

A digital growth prediction model integrates "light-atmosphere-soil-crop" parameters based on citrus growth characteristics, incorporating algorithms for photosynthesis, respiration, water and nutrient transport, and crop development. As the "core brain" of the platform, this subsystem predicts phenological stages and offers optimal

farming recommendations. Tailored for Chongqing's mountainous terrain, it includes slope correction to address issues such as delayed fruit maturity due to insufficient accumulated temperature on shaded slopes. It also provides visualizations of key indicators like fruit expansion rate and sugar accumulation over a 30-day period.

2. Pest and Disease Warning Subsystem

Integrating weather forecasts and pest and disease mechanisms, this subsystem provides plot-level predictions for outbreaks over 15 days, one month, and three months, covering common threats like citrus black spot, canker, spider mites, and leaf miners. Early warnings help growers optimize chemical applications and minimize losses. The system also supports field sampling by experts and agronomists to build an image database of pests and diseases, enabling automated identification and control technologies for more scientific prevention and treatment recommendations.

In Argentina, BASF's FIELD MANAGER solution developed a prediction model for soybean diseases, generating spray recommendations based on climate data, variety traits, sowing time, and regional disease thresholds. After four years of local validation (covering over 200 field trial sites), the model achieved 80% accuracy, and its recommended spraying schemes delivered a return on investment of USD 35 per hectare.

3. Crop Condition Monitoring Subsystem

Chongqing's mountainous and hilly terrain makes traditional manual orchard inspections inefficient. As the agricultural workforce ages, yield losses due to inadequate and untimely inspections have become a major challenge. Using high-resolution satellite imagery and drone-based visible light remote sensing, this subsystem monitors citrus growth throughout the lifecycle, identifies areas of poor growth, and alerts growers to take timely corrective measures.

4. Soil Moisture and Nutrition Monitoring Subsystem

This subsystem combines field sensors with the growth prediction model to collect, monitor, and analyze environmental data in real time. Linked with an automated GIS processing system, it generates dynamic spatial distribution maps of water and nutrient levels during the growth cycle, providing a comprehensive assessment of orchard conditions. Mini weather stations are recommended to collect data on air temperature, humidity, wind speed/direction, rainfall, light intensity, air pressure, and pH, while soil sensors monitor moisture and salinity. These comprehensive data support optimized fertilizer and irrigation management.

5. Agricultural Input Recommendation and E-Marketplace Subsystem

This e-marketplace subsystem recommends high-quality input solutions based on common pest and disease threats and soil nutrient conditions in Chongqing. The government is encouraged to invite leading domestic and international suppliers to offer cost-effective products to growers. Integrated with analytics from other subsystems,

it pushes timely and appropriate input recommendations to farmers. As a global leader in agricultural technology, BASF is committed to collaborating with the Chongqing Municipal Government to develop localized solutions for pest control and fertilization, tailored to regional conditions. The subsystem also tracks farmers' purchasing patterns, quantifies pesticide reduction and carbon footprint, and supports the government in designing future incentives for sustainable agricultural practices.

IV. Conclusion

The 2025 No. 1 Central Document explicitly identifies smart agriculture as a core technology for rural revitalization, emphasizing digitalization to enhance agricultural productivity and farmers' income. As a key fruit crop and a pillar of Chongqing's agriculture, citrus production is a strategic priority. Investing in its digital transformation is a timely and wise decision that aligns with national policies and leverages local advantages.

In 2025, BASF, together with the China Citrus Research Institute, held the "Secardis Plus" forum to address the growth characteristics of citrus in the Sichuan and Chongqing regions, as well as the patterns of diseases and pests, and to assist users in improving the quality of fruits, color and value through the use of the Secardis Plus+ solutions. Extending to decades of trustful cooperation with Chongqing on developing the polyurethane-based new material value chain, BASF looks forward to partnering with the relevant sectors in Chongqing to drive comprehensive upgrades in the citrus industry chain through digitalization, ultimately realizing the vision of "farmers growing high-quality fruit with confidence, and high-quality fruit receiving fair pricing."

Recommendations for Chongqing to Promote "AI + Industry" Strategy and Advance Digital-Intelligence Integration

Honeywell

Introduction

Chongqing is a nationally significant city and the sole municipality directly under the central government's administration in the central and western regions of China. It boasts a solid foundation in the digital economy sector and possesses robust industrial strength.

At present, China is vigorously advancing technological innovation, seizing the opportunities of the AI revolution, and promoting the integration of the digital and real economies. Chongqing plays a pivotal role in the overall development landscape of the central and western regions, as well as across the entire nation. It can continue to increase investment in artificial intelligence and the digital economy to further achieve a new leap forward in high-quality development.

As a multinational company with long-term investment in Chongqing, Honeywell greatly values the many opportunities it has to participate in the Chongqing Mayor's International Economic Advisory Council meetings. On this occasion, we would like to share our perspectives on building a hub for AI applications and supporting innovation-driven development, with the hope of contributing knowledge and expertise to the city's developments of digital economy and AI.

We suggest that Chongqing leverage its industrial strengths and further integrate emerging digital technologies such as artificial intelligence. By positioning itself as a leading hub for "AI + Industry," the city can accelerate the development of digital-intelligence infrastructure, expand real-world application scenarios, and foster a dynamic innovation ecosystem.

I. Current Development of Chongqing's Artificial Intelligence Industry

Overall, Chongqing has many favorable conditions for developing the AI industry, but also faces certain challenges.

Chongqing benefits from macroeconomic, industrial, and policy advantages in AI development. With a robust economic backbone and an extensive industrial base, the city has a solid foundation for developing "AI + Industry."

On the industrial side, Chongqing has a comprehensive landscape, and the city's automobile and electronics industries have grown rapidly. In recent years, the city has seized the opportunity of new energy vehicle (NEV) development, making itself a leading hub in China's NEV industry. AI is closely intertwined with fields such as the electronics industry, hardware manufacturing, and the production and operation of NEVs. Chongqing's existing industrial structure naturally aligns with AI application, giving it the opportunity to become a pioneer and demonstration zone for industrial digital-intelligence transformation.

From a policy standpoint, Chongqing enjoys the combined policy advantages of being a municipality directly under the central government and a key city within the Chengdu-Chongqing Economic Circle, along with the strategic location benefits of being part of the Yangtze River Economic Belt and the New International Land-Sea Trade Corridor. These factors enable it to attract a wide range of talent, pool resources, and strengthen its momentum for development, providing strong support for the growth of AI and other emerging industries.

Despite these advantages and significant potential, it is important for us to acknowledge that Chongqing still lags behind in certain aspects of AI development compared with the country's leading regions and cities.

Relative to its strong overall economic and industrial base, Chongqing ranks lower among major cities in the digital economy and AI fields. In 2024, Chongqing's core AI industry recorded only RMB 17.1 billion, far below the levels of Beijing, Shanghai, Shenzhen, and Hangzhou, and just one-sixth the size of Chengdu's.

Especially in the industrial sector, the challenge Chongqing faces in developing "AI + Industry" lies in the abundance of industrial scenarios, paired with a relative lack of robust technological capabilities to support them. Therefore, Chongqing should accelerate efforts to address technological gaps and foster an AI industry innovation landscape driven simultaneously by both "technology and scenarios".

II. Recommendations for Implementing "AI + Industry" in Chongqing and Advancing Digital-Industrial Integration

To implement the "AI + Industry" strategy, Chongqing should fully leverage its industrial, geographic, and policy advantages; strengthen government policy guidance; mobilize enterprises, universities, research institutes, and society at large; and build a solid foundation of infrastructure, application scenarios, talent, and an innovation ecosystem.

1. Promote AI Infrastructure and Build Strong AI Foundations

As an emerging industry, AI depends on a new generation of infrastructure. Nowadays, the integration of GPUs and cloud computing is becoming mainstream, while the convergence of 5G and AI is increasingly close. If Chongqing aims to be a national leader in the AI era, it needs to strengthen its capabilities in both algorithms and computing power, positioning itself as a smart city in western China.

Chongqing could take advantage of southwestern China's abundant hydropower resources and relatively low electricity costs, to build advanced computing infrastructure and construct a demonstration city for the "East-to-West Computing Resource Transfer Project," which aims at transferring Chinese computing resources from the east to the west of the country.

At the same time, accelerating the rollout of 5G networks is needed to guarantee the quality of AI real-time interactive communication.

Additionally, Chongqing could strengthen reserves of hardware and software in fields such as GPUs and industrial software, bridging the computing power gap and creating favorable developing conditions for more AI enterprises.

AI applications require infrastructure first. Just as developing industrial zones needs foundational work like utility access and site leveling, advancing the AI industry and embedding AI in industrial practices require AI-ready infrastructure from the outset. By effectively integrating AI infrastructure with existing industrial systems, Chongqing's "AI + Industry" initiative can secure a stronger starting position.

Data centers are both critical infrastructure for "AI + Industry" and key scenarios for AI application. In fact, AI technologies are already widely applied in data center operations and management, supporting their green and intelligent transformation.

In the future, Chongqing is expected to see massive demand for data center construction and operation. Honeywell's proven track record in supporting data centers across other regions in China can be replicated in Chongqing. For instance, at a large-scale cloud computing facility in a city in China with over 25,000 ㎡ of floor space and 1,800 high-capacity racks (8KW–20KW), Honeywell provided its Enterprise Buildings Integrator platform along with Honeywell PLC control systems and AI algorithm for energy saving. Supported by AI controllers, the facility achieved more effective server cooling and significantly improved operational efficiency.

Looking ahead, every industry will evolve toward "AI + Industries." Beyond data centers directly serving AI, industrial parks and office buildings will increasingly become AI application scenarios.

In large buildings and business parks, improving energy efficiency remains a persistent challenge. High tenant turnover and outdated control systems often lead to unnecessary energy consumption. AI is now reshaping this landscape through dynamic, data-driven management. Imagine an AI-enabled Heating, Ventilation, and Air Conditioning (HVAC) system that automatically powers down unused office areas based on real-time occupancy, or lighting that adjusts brightness according to natural daylight levels. By integrating AI into energy management, organizations can dynamically optimize lighting, temperature control, and water systems—an approach increasingly viewed as central to the future of smart urban operations.

At the third China International Supply Chain Expo in July this year, Honeywell launched an advanced op-

erations module for its smart building management platform. This module focuses on three core functions—asset management, automated inspections, and predictive maintenance—while integrating equipment monitoring, health alerts, and customized maintenance reporting, enabling smarter operation, lower energy consumption, higher efficiency, and greater safety for systems such as air conditioning.

We look forward to bringing this module to support the green operation of Chongqing's industrial parks and office buildings.

In June of this year, Honeywell also launched a new artificial intelligence platform for building operations, which has been deployed overseas. This platform integrates critical building software and technologies through a unified interface, including advanced security encryption, remote monitoring and diagnostic capabilities, predictive maintenance prompts, and energy management technologies. It supports facility managers, multi-site operators, or integrators in performing AI-assisted installations. If this system can be implemented in Chongqing, it could make the management and operation of large buildings more convenient.

2. Promote the Implementation of "AI + Industry" in Diverse Scenarios and Advance Digital-Intelligent Upgrading Across Chongqing's Industrial Sectors

Chongqing is one of the country's major comprehensive industrial hubs. The "AI + Industry" strategy is an important initiative to drive industrial upgrading in Chongqing, supporting its transition from a large industrial base to a strong industrial powerhouse.

It is essential for the city to fully leverage AI technology to optimize production and manufacturing processes, thereby improving industrial efficiency. A series of AI demonstration applications in areas such as NEVs and biopharmaceuticals should be established, creating a distinctive "Chongqing model" for "AI + Industry." This will help position Chongqing at the forefront nationwide in utilizing AI to strengthen the real economy.

(1) Fully Harness AI to Optimize Industrial Production Processes

Industrial production is confronted with three pivotal challenges: the first lies in asset management—how to orchestrate and harness hardware resources with maximal efficiency; the second revolves around process refinement—how to pursue unceasing optimization with precision; the third pertains to human capital—as industrial machinery has, for an extended period, been heavily anchored to manual operation, fostering a profound reliance on the expertise of skilled workers, technicians, and engineers.

AI offers unique advantages in addressing these challenges. It helps enterprises to manage and utilize hardware, handle data assets generated during production processes more securely, and it enables equipment to operate automatically with greater efficiency and stability. This improves efficiency while reducing reliance on individual operator skill, minimizing errors, accidents and inefficiencies.

As a major industrial hub, Chongqing should promote wider adoption of AI assistants by enterprises to support comprehensive process management and optimization, thereby enhancing the operational efficiency of its industries.

In this area, there are already mature practices that Chongqing can draw on. Honeywell's AI solutions enables factories to reduce costs, boost efficiency, and extend equipment lifespan across the full operational lifecycle–from equipment use and data acquisition to fault detection, downtime, and maintenance. Honeywell has launched the Experion® Process Knowledge System (PKS) and its "Field Advisor" AI software, which provides a unified operational interface for field-related tasks. The system can access the AI-assisted Experion® Operations Advisor to help operators identify and resolve production issues. By working alongside factory operators, the Experion® Operations Advisor not only optimizes operations but also accelerates the transfer of decades of industry expertise to less experienced staff. The upcoming new generation of Experion® control systems integrates AI capabilities, introducing Explainable AI (XAI) into the operator human-machine interface (HMI). It can predict potential failures and provide step-by-step guidance to prevent incidents, thereby ensuring stable and efficient plant operations.

In China, the intelligent DPH (Propane Dehydrogenation) plant built by Honeywell for Shenghong Petrochemical Industry Group, has achieved a 15% extension in equipment lifespan and a 25% reduction in maintenance costs, demonstrating the significant effect of AI in process optimization. Globally, Honeywell has successfully delivered integrated and practical solutions for numerous large enterprises and continues to engage in in-depth collaborations.

(2) Explore "AI+" in Life Sciences Manufacturing

Life sciences are a cutting-edge field of our time. Manufacturing in this domain holds vast potential and is a key component of Chongqing's innovation-driven industrial development. Given the sector's sensitivity to product quality and dosage, the demand for AI-enabled lean management is especially pressing.

Today, most companies in life sciences manufacturing still rely on paper-based workflow management, causing errors, inefficiencies, poor data utilization, potential delays in innovative drug launches, and, ultimately, profit losses for pharmaceuticals.

For enterprises in this sector, R&D and production efficiency directly shape competitiveness. Applying AI systems to manage the entire R&D and production lifecycle can help enterprises capture opportunities in the AI era while navigating complex challenges more effectively.

Honeywell has achieved notable progress in this field. In April, we launched Honeywell TrackWise® Manufacturing, an AI-powered, cloud-native platform designed to transform how life sciences companies manage, automate, and digitize operations. The platform integrates AI-assisted workflows to streamline processes, helping manufacturers shorten technology transfer timelines and bring products to patients faster. By leveraging its capabilities, biopharmaceutical enterprises can optimize process execution and ensure operational continuity. Its con-

tainerized architecture offers flexibility and adaptability, enabling manufacturers to respond quickly to changing market demands while meeting regulatory requirements.

Furthermore, Honeywell recently unveiled an innovative technology utilizing artificial intelligence to assist in the counting and classification of tiny particles or cells (such as blood cells), aiming to accelerate the treatment process for chronic disease patients and enhance laboratory analysis efficiency. This technology simplifies biological sample preparation by employing machine learning algorithms to distinguish cell types, thereby avoiding the need for staining procedures. This innovation offers several advantages over traditional microscopy methods, such as enabling a simplified and portable instrument design. This allows for on-site testing and analysis without the necessity of sending samples to a laboratory. Additionally, this technology can replace or supplement sample analysis methods, providing faster test results by streamlining processes.

We hope our products and technologies could be applied in Chongqing, significantly boosting the efficiency of local life sciences manufacturing enterprises, further strengthening and consolidating the city's competitiveness in this strategic sector.

Conclusion

This year marks the conclusion of China's 14th Five-Year Plan, and next year ushers in the 15th Five-Year Plan period. Chongqing is now presented with dual opportunities arising from national strategic planning and the new technological revolution.

"AI + Industry" represents a forward-looking pathway for Chongqing, aligning national development priorities with the city's own strengths. The powerful multiplier effect generated by integrating Chongqing's robust economic base, solid industrial foundation, and emerging AI technologies can open entirely new space for the city's high-quality development.

Honeywell remains firmly optimistic about China, particularly the development potential of its central and western regions. Having been deeply rooted in Chongqing for 18 years, we believe the city's practices will have a broad spillover effect, serving as a model for southwest, central and western China—and even the whole nation. Honeywell is committed to continuously exploring frontier innovation in Chongqing.

Honeywell has consistently followed its "East-for-East" strategy, emphasizing localized practice and R&D, and embedding China's development agenda into its global strategy. We will continue channeling our global resources and technologies into China, into Chongqing, and integrating them deeply with local needs and contexts.

Looking ahead, Honeywell looks forward to working with all parties to help Chongqing seize the significant opportunities of the AI era, with a strong focus on the theme of "AI + Industry." The goal is for Chongqing to become an exemplary city for AI-driven industry development, a fertile ground for innovation and entrepreneurship, and a leading center for AI industrial applications.

Advancing AI Applications to Drive High-Quality Growth in Chongqing's Manufacturing Sector

Cummins

Amid the global wave of digital transformation, artificial intelligence (AI), as a strategic emerging industry, is increasingly becoming a core technological driver of industrial upgrading, economic growth, and social change. China's AI sector has entered a phase of rapid development, marked by a systematic approach and large-scale implementation.

Drawing on Cummins China's experience with AI technology—particularly the innovative applications by our joint venture in Chongqing, Chongqing Cummins Engine Co., Ltd. (CCEC)—this paper offers recommendations for the intelligent transformation of Chongqing's manufacturing sector, aiming to support the region's digital upgrade and the sustainable growth of advanced manufacturing.

I. Cummins China AI Application Development Overview

Cummins China attaches great importance to the application of AI technology in its business areas and has established a special technical team led by senior experts and established a cross-departmental coordination mechanism. Under the high priority and direct guidance of Management Team, the company has systematically promoted AI capacity-building and has also established an AI and Digital Academy within company's "Supply Chain University", which is fully involved, to develop a series of professional training courses to improve the digital capabilities of the organization. This series of strategic deployment fully embodies the company's concept of business transformation driven by technology innovation.

(I) Cummins China's AI Strategic Planning and Implementation: Dual-Track Development System

Cummins China has developed a dual-track AI system that integrates decision-making AI and generative AI, based on forward-looking research into industrial intelligence trends. Decision-making AI leverages structured data and rule-based engines to enhance decision support systems in key business areas such as risk management, quality monitoring, and intelligent diagnostics. Generative AI, powered by deep learning algorithms, enables innovative applications like building industry knowledge graphs, digitizing operational expertise, and delivering intelligent knowledge services in its manufacturing sector.

To ensure the system operates effectively, the company has established a comprehensive data governance framework that spans the entire lifecycle—from data collection and cleaning to labeling and quality control—providing a robust foundation for model training. Additionally, the development of a low-code application platform has significantly lowered the barrier to AI adoption, empowering business teams to create intelligent applications and driving breakthroughs in practical implementation.

On the integration front, Cummins has built a cross-platform data flow mechanism that seamlessly connects AI systems with the company's existing IT infrastructure, greatly enhancing its overall operational efficiency. The company has also launched a structured AI capability training program to equip all employees with the skills needed to use intelligent tools, thereby boosting organizational innovation.

As an industry technical leader, Cummins China actively fosters collaborative innovation across the value chain. Through technology sharing and joint R&D efforts, it has deeply embedded AI into every segment of the industrial ecosystems which significantly advances the overall level of intelligence across the sector.

(II) Technical Achievements and Value Realization of AI Applications

In recent years, Cummins China has achieved a series of systemic breakthroughs in artificial intelligence. By building a group-level AI enablement platform, the company has facilitated cross-enterprise collaborative innovation and scenario-based implementation.

In the area of decision-making AI, Cummins China has developed several core technologies. For example, the intelligent tightening analysis system, co-developed with its another joint venture in China - Foton Cummins, leverages full-cycle process data monitoring and failure prediction models to significantly enhance quality control in assembly processes. The cloud-edge collaborative vision inspection system, deployed with CCEC, uses deep learning algorithms to achieve over 95% defect detection accuracy and an 80% boost in productivity. Additionally, the intelligent scheduling system, developed with Wuxi Turbocharger Technology Co., Ltd., has greatly improved production line flexibility and utilization.

In the field of generative AI, the company has introduced two innovative solutions tailored to manufacturing:

◎ The intelligent document structuring system automates the conversion of non-standard documents, improving integration across operational systems.

◎ The code-free knowledge management platform uses natural language processing to build enterprise knowledge graphs, significantly reducing training costs and freeing up expert resources.

These innovations not only drive substantial gains in production efficiency but also offer a reusable technological model for digital transformation in manufacturing.

Cummins China has also established a unified AI R&D and application platform that supports both deci-

sion-making and generative AI. This system enables efficient knowledge sharing and rapid replication of innovations across business units through a standardized technology architecture. As a result, the company has significantly improved AI implementation efficiency and fostered a decentralized innovation ecosystem.

II. Results of CCEC' AI Technology Applications

Recently, CCEC invested RMB 1.5 billion to establish a new high-horsepower engine R&D and manufacturing base in Liangjiang New District, accelerating the development of new quality productivity and advancing its digital and intelligent transformation. Since the new base's launch, CCEC has shown strong business momentum, with revenue and tax contributions continuing to grow rapidly year over year. In 2023 and 2024, the company's revenue increased by 26% and 36% respectively, and is expected to maintain growth in 2025.

During this process, AI applications have played a significant role in driving its business performance, contributing over RMB 10 million in cost savings, greatly enhancing the efficiency of the intelligent Q&A system, reducing operational risks through AI-powered security technologies, and strengthening employees' AI capabilities.

(1) Joint Progress with Cummins China CCEC has actively integrated into Cummins China's AI-driven ecosystem, adopting a range of platforms to help build a unified digital environment. Through internal promotion, the company has achieved significant improvements, including:

1. Low-Code Development Platform Application:By deploying Cummins' standardized low-code platform, CCEC successfully transformed fragmented and manual management processes into a more systematic and digitalized model, greatly enhancing its information management capabilities.

2.Decision-Making AI Implementation:As the first company within the group to implement self-training AI for visual quality inspection, CCEC reduced the deployment cost of traditional vision inspection systems by 80% through equipment re-engineering and autonomous model training. The implementation cycle was shortened by 50%, while maintaining a recognition accuracy rate above 95% through continuous self-training and iteration.

3.Generative AI Innovation:As an early adopter of the generative AI platform, CCEC independently developed 15 intelligent Q&A bots within a year. These bots are widely used in manufacturing processes, quality management, and IT support, significantly improving employee efficiency.

(2) CCEC' Independent Innovation PracticesBeyond adopting Cummins' standard ecosystem and applications, CCEC has also launched several pilot innovations based on this foundation, including:

1. AI-Powered Collision Avoidance System:By integrating wireless positioning, 5G communication, and AI visual recognition, the company developed an intelligent collision avoidance system for mobile industrial vehicles. This enables traditional forklifts and other manned vehicles to receive real-time collision warn-

ings. The solution has been incorporated into Cummins China's Eco-Solutions portfolio and is now being replicated across other group companies.

2. Smart Park Development:In collaboration with on-site IoT infrastructure, CCEC established the "Chongqing Cummins Smart Park." This initiative integrates various digital applications into a centralized digital operations platform, enabling real-time visibility into production, safety, and logistics management, and achieving digital synergy across core business functions.

III. Recommendations for Optimizing AI Industry Development in Chongqing

As AI technology continues to evolve across industries, its application shows varied progress. However, there is still room for improvement in areas such as policy coordination, data governance, and security frameworks. The following recommendations are proposed:

(1) Establish a Standardized AI Application Framework: Given the uneven development of AI and the lack of consistent application standards across industries, it is recommended to build a multi-tiered standardization system. Government agencies can take the lead by coordinating resources from industry associations, research institutions, and leading enterprises to develop standards in key areas—particularly in manufacturing, such as intelligent quality inspection and production scheduling.By creating unified AI application and technology standards, interoperability and compatibility across enterprises and sectors can be improved, enhancing industrial collaboration and fostering a healthy, orderly ecosystem. Financial incentives should also be considered to introduce to encourage enterprise participation in standard-setting and to support the deployment of AI products and services that meet these standards.

(2) Expand Generative AI Applications in the Industrial Sector: While generative AI has seen notable success in consumer-facing applications—such as content creation and image generation—its potential in enterprise (B2B) contexts remains underutilized. It is recommended to focus on developing generative AI use cases in the B2B market.Pilot programs could be launched with technically capable companies, especially in areas like industrial design, to promote AI-assisted design systems. A collaborative innovation mechanism should be established, along with a technology transfer platform, targeted policy support, and technical guidance for pilot enterprises to accelerate the commercialization of innovation outcomes.

(3) Accelerate Data Integration and Transactions, Break Down Barriers to Data Flow, and Improve the Data Market Mechanism: Data is the cornerstone of AI development, yet barriers to data sharing and circulation persist across enterprises and departments. It is recommended to expedite the creation of a data asset registration and transaction system, addressing core issues such as data validation and value assessment.Efforts should be made to build a standardized data trading market, dismantle departmental silos, and provide high-quality data resources to support AI industry growth.To ensure high-quality development, a comprehensive data governance and security framework must be established. Enterprises should incorporate data assets into financial reporting to

strengthen strategic data management. Simultaneously, legal and regulatory systems for data transactions should be developed to ensure orderly market operations.At the government level, a standardized data trading platform should be built to offer compliant and efficient infrastructure for data circulation, unlocking the full value of data and supporting AI innovation.

(4) Strengthen the Safety and Security Framework for Generative AI Services：Generative AI requires a multi-layered security system to mitigate risks such as data leakage and misinformation. It is recommended to enhance supervision through the following measures:

◎ Establish an industry self-regulation mechanism, requiring service providers to publicly commit to security compliance.

◎ Accelerate the development of dedicated legislation to clarify corporate responsibilities and increase penalties for violations.

◎ Encourage enterprises to implement comprehensive data security emergency plans, covering risk monitoring, incident reporting, and response management.Government authorities should regularly conduct emergency drills and build industry-wide early warning systems to strengthen overall risk prevention and control.

Finally, with strong support from the Chongqing Municipal Government, and through systematic initiatives such as standardization, application scenario expansion, data market development, and enhanced security governance, the AI industry is poised to become a key driver of regional economic transformation and high-quality growth—guided by both policy leadership and market forces in Chongqing.


CMIA