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Development Strategy on China's Service-oriented Manufacturing During 14th Five-Year Plan Period

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Abstract
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Keywords
service-oriented manufacturing; 14th Five-Year Plan; development strategy

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Abstract: During the 14th Five-Year Plan period, China will enter a new stage in reform and opening up and modernization. It is essential to promote the development of service-oriented manufacturing and build a modern industrial system. With deeply understanding and conscientiously implementing the strategic deployment of the Central Committee of the Communist Party of China and the State Council, the development of service-oriented manufacturing must focus on building a new development pattern with domestic cycles as the main body and mutual promotion of domestic and international double cycles, and comprehensively improve the capabilities of scientific and technological innovation, value creation and industries competitiveness. The study puts forward the overall requirements and main goals for the development of service-oriented manufacturing in China during the 14th Five-Year Plan period, and proposes some relevant policy recommendations from six aspects including strategic planning, enterprises’ digital transformation, technological innovation system, industrial ecology cultivation, service-oriented manufacturing agglomeration, and international competition and cooperation.

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During the 14th Five-Year Plan period, China will enter a new stage of reform and opening up and modernization. It is essential to promote the development of service-oriented manufacturing and the building of a modern industrial system. With deeply understanding and conscientiously implementing the strategic deployment of the Central Committee of the Communist Party of China and the State Council, the development of service-oriented manufacturing must focus on building a new development pattern with domestic cycles as the main body and mutual promotion of domestic and international double cycles, with the general trends of the transfer from high-speed growth to medium-to-high-speed growth, from mid-to-low-end industry to mid-to-high-end industry, and from traditional industries to emerging industries, to comprehensively improve the capabilities of scientific and technological innovation, value creation and industries competitiveness of manufacturing in China.

Overall requirements for the development of service-oriented manufacturing: ① Guided by the new development strategy implemented, the economic development pattern should be transformed, and high-quality development should be adhered; ② the quality reform, efficiency reform, and power reform centered on the improvement of total factor productivity should be promoted; ③ it is essential to upgrade the industrial foundation and realize industrial chain modernization; ④ it is crucial to promote knowledge innovation, technical innovation, regional innovation, military-civilian scientific and technological collaborative innovation and effective interaction; ⑤ it is pivotal to form the market competitive strengths centered on technology, brand, quality, standard, and service; ⑥ it is critical to create the cleanness, efficiency, low-carbon, and circulation-oriented venous industrial chain and green supply chain; ⑦ it is indispensable to build the legal environment, policy system and cultural atmosphere revitalizing service-oriented manufacturing, respecting knowledge and skills, and advocating innovation and creation.

Main development goals of service-oriented manufacturing: ① In terms of industrial structure, the traditional industries and manufacturing should be transformed to modern industries and manufacturing, to accelerate the development of new economic forms of digital industrialization and industrial digitization; ② in terms of technical composition, the traditional manufacturing technology should be transformed to digital, intelligent, and green manufacturing technology, to accelerate the construction of a modern manufacturing technology system; ③ in terms of innovation development, several breakthrough should be accumulated to system capability improvement, to accelerate system innovation, technical innovation, and business mode innovation; ④ in terms of market competition, the mid- and low-end
product market should be upgraded to mid- and high-end product market, to increase the share of high-quality brands on markets in China and abroad; in terms of value creation, the high cost and low efficiency should be transformed to low cost and high efficiency, to improve lean production level and input-output efficiency; in terms of environmental protection, the extensive economic growth mode should be transformed to the resource-saving and environment-friendly economic growth mode, to optimize the allocation and comprehensive utilization of resources, and develop the re-manufacturing industry.

1 Strengthening of the study of service-oriented manufacturing development strategy

(1) Compilation of the 14th Five-Year Plan for service-oriented manufacturing. The 14th Five-Year Plan for service-oriented manufacturing is compiled under the leadership of the National Manufacturing Power Construction Leading Group to clarify the development goals, key tasks and specific measures of service-oriented manufacturing, and also follow the relevant documents, such as Special Action Guide for the Development of Service-Oriented Manufacturing, Implementation Opinions on Promoting the Deeply Integrated Development of Advanced Manufacturing and Modern Service Industries, and Guidance on Further Promoting the Development of Service-Oriented Manufacturing. In addition, the functions of local governments should be strengthened in aspects of planning and policy implementation, environmental construction, public services, and market supervision.

(2) Improvement of the development decision-making consultation system of service-oriented manufacturing. The working mechanism of the National Manufacturing Power Construction Strategy Advisory Committee (hereinafter referred to as “the Advisory Committee”) in terms of overall planning, independence, and transcendence of departmental interests should be improved. The communication and coordination between the three-year plan working group for the development of service-oriented manufacturing and other professional committees of the Advisory Committee should be strengthened to discuss the development path and characteristic mode of manufacturing services. The service-oriented manufacturing experts should be organized to carry out special investigations and studies on major issues in the development of service-oriented manufacturing, so as to put forward technical forecasting, project demonstration, feasibility study report, decision-making consultation and policy suggestion.

(3) Tracking and determination of the development trend of global service-oriented manufacturing. The intermediary institutions, universities, research institutes, industry alliances/associations and think tank institutions should be encouraged and supported to study the service-oriented manufacturing modes, analyze the service-oriented manufacturing evolution, business model and successful experience of typical multinational companies, and continuously track the division of labor in the global manufacturing industry chain, the development law of manufacturing services, and development trend of service-oriented manufacturing. They should also be encouraged to carry out in-depth international comparative analysis on high-end, intelligent, green, and intensified service-oriented manufacturing, and clarify the direction of development.

(4) Optimization of development layout of service-oriented manufacturing. The demonstration enterprises, demonstration projects, demonstration parks and demonstration cities of service-oriented manufacturing should be constructed based on the development foundation and layout characteristics of regional manufacturing development. The investment direction is determined based on the overall deployment of service-oriented manufacturing and according to the regional technology, industry, and talent advantages, so as to avoid invalid, inefficient, and repeated investment. The pilot demonstration zones for service-oriented manufacturing should be established in various fields to provide reference for “manufacturing + service” in various industries, and drive the service-oriented transformation of manufacturing in China.

(5) Improvement of capabilities of manufacturing industry associations for providing professional services. While relying on industry associations, the relevant government departments are assisted in developing service-oriented manufacturing development plans, industrial policies, various standards, laws and regulations, and performing market supervision, qualification review, qualification certification, and statistical analysis in accordance with the laws. The professional service platform should be established, and the technology maturity, industry maturity, and market maturity of service-oriented manufacturing enterprises should be assessed to provide a scientific basis for enterprise development, technology research and development, financial investment, and government decision-making.

(6) Improvement of service-oriented manufacturing statistical indicators and evaluation system. The scientific and reasonable classification accounting standards should be determined, and the statistical indicators and evaluation system reflecting the development characteristics of service-oriented manufacturing should be established. Quantitative analysis should be combined with qualitative analysis, static management should be combined with dynamic management, and macro-monitoring should be combined with micro-monitoring, to perform the comprehensive evaluation on the development of service-oriented manufacturing. The socialized, professional, and international service-oriented manufacturing evaluation channels are actively expanded.
2 Promotion of digital transformation of service-oriented manufacturing

(1) Acceleration of the construction of digital infrastructure. The interconnected intelligent digital infrastructure system, the communication network infrastructure represented by 5G, Industrial Internet, and Internet of Things, and the computing power infrastructure represented by data centers and intelligent computing centers should be constructed to provide support for big data collection, transmission, storage, and calculation in manufacturing, thereby promoting the development of computing technology and industry. The quality and efficiency of digital infrastructure services should be improved. Real-time monitoring of the operating conditions should be performed and the problems of data segmentation and Information Island should be solved.

(2) Improvement of the digital transformation service capability. A group of digital technology enterprises should be cultivated to provide customized digital transformation system solutions for large and medium-sized manufacturing enterprises. The construction of cloud manufacturing and cloud service platform should be promoted, and resource-based, process-based, product-based and service-based platforms should be developed, thus providing professional services for the digital transformation of small and medium-sized enterprises (SMEs). In addition, the digital transformation promotion plan should also be implemented for SMEs, and the digital guidance fund for SMEs should be established.

(3) Promotion of the application of digital technologies in enterprises. The application of digital technologies in manufacturing should be promoted, such as big data, industrial Internet, cloud computing, Internet of Things, and edge computing. The “digital twin” based on the manufacturing process should be established to promote the transformation of traditional manufacturing to service-oriented manufacturing and intelligent manufacturing. On the basis of the whole process data, the expansion of manufacturing from manufacturing link to the front and back service links of the industrial chain should be promoted; the digitalization of product design, production process, operation management, marketing and decision-making systems should be promoted; the role of digital technology in empowering the real economy should be exerted.

(4) Establishment of the industrial digital empowerment standards. The industry associations and enterprise alliances should be supported to take the lead in formulating industry data standards, and accelerate the standardization of data interfaces and data formats in the process of digital transformation of the manufacturing. The connection and data transmission barriers of manufacturing parts, production lines, and products should be broken to promote the development of value-added services centered on data flow. Data collection, storage, and transaction systems should be established and improved, and the connection among the standard system, the certification and accreditation, and inspection and testing system should be strengthened to realize standard application and open sharing of data in a wider range.

(5) Effective strengthening of digital security supervision. The data protection supervision rules and emergency plans should be prepared to improve the level of data security and the ability to respond to the challenges in data security. The enterprises should be supervised to implement the data security protection measures in data collection, storage, processing, transfer, and deletion, and strengthen the secure access and protection of production equipment, host equipment, and smart terminal equipment. The enterprises’ capabilities of supervising internal and external network facilities must be improved to strengthen the security of control systems, equipment and industrial software.

(6) Cultivation of talents in digital transformation development. Digital technology and service-oriented manufacturing majors or courses must be set in higher schools and the related secondary vocational schools to strengthen the professional training in terms of R&D design, entrepreneurial incubation, intellectual property, financial leasing, logistics management, information technology, energy conservation and environmental protection, human resources and brand building. The dominant role of enterprises in vocational education should be fully exerted. A talent training system that integrates production and education, science and education should be established, and all kinds of digital innovation, management talents and digital workforce should be cultivated.

3 Establishment of a technical innovation system for service-oriented manufacturing

(1) Giving full play of the dominant role of enterprise innovation. The incentive policies for encouraging enterprises should be implemented to increase R&D investment and establish technology centers. A batch of high-tech service-oriented manufacturing enterprises should be selected from high-tech enterprises. An enterprise-centric and market-oriented technical innovation system with the goal of catching up with advanced enterprises should be established, and a group of leading service-oriented manufacturing enterprises mastering core technologies and integrated innovation capabilities, and leading the development of important industries should be cultivated.

(2) Further promotion of deep integration of industry, university, research and application. The establishment of the industry-academia-research consortia, cooperative innovation bases and innovative engineering laboratories should be promoted in the field of service-oriented manufacturing. The original innovative technology, cutting-edge leading technology, modern engineering technology, and disruptive technology should be developed, and attention should be
attached to breakthroughs of new manufacturing technology, information technology, biotechnology, and new material technology. Continuous innovation in industry-research cooperation, cross-industry integration, market mechanisms, service formats and business modes should also be promoted.

(3) Establishment of a support system for industrial technology innovation. The technology platforms and service organizations for R&D outsourcing, technology transfer, entrepreneurial incubation, innovation alliance, technology finance, and intellectual property should be developed. A synergistic, complementary, open, cooperative, and vigorous support system for industrial technology services should be established based on the enterprises and facing the market. The construction of major scientific and technological infrastructure platforms, analysis and testing platforms, scientific data centers, scientific and technological literature sharing platforms and other service-oriented public scientific and technological innovation platforms should be coordinated, thus forming an independent and controllable ecological chain of industrial technology data sharing and application.

(4) Strengthening of transformation and application of scientific research achievements. The construction of a supply-demand matching mechanism should be strengthened for the transformation of scientific research achievements and technical demand for service-oriented manufacturing. A fair and reasonable distribution policy based on effective motivation should be standardized and established, and the relevant laws and policies regarding ownership, use, disposal, and distribution of scientific and technological achievements should be implemented. The preferential policies, financial support, and institutional guarantee for intellectual property achievements should be provided, thus further strengthening patent protection for the digestion, absorption and innovation of imported technologies, and gradually increasing the market share of patent royalties and technology transfer fees.

(5) Further promotion of collaborative innovation between military and civilian technologies. The military and civilian scientific and technological innovation resources should be coordinated to enhance resources sharing, and promote the coordinated, balanced and compatible development of national defense technology and civil technology innovation systems. The deep integration of the defense industry and civilian manufacturing should be coordinated and strengthened to accelerate the standardization and generalization of the defense industry, clear the channels for the exchange of military and civilian technologies, promote the two-way transfer and transformation of military and civilian technologies, and increase the supply of key manufacturing technologies. Furthermore, the construction of major scientific research bases, industrial production bases, talent training bases and infrastructure for military and civilian uses should be coordinated, and advantageous private enterprises should be guided and encouraged to participate in the development and production of military products and provide value-added services of manufacturing.

4 Improvement of the development ecology of service-oriented manufacturing

(1) Improvement of public service system of service-oriented manufacturing. The reform measures of “decentralization, regulation and service” should be deeply implemented to stimulate the market vitality and innovation capacity of service-oriented manufacturing enterprises. The service-oriented manufacturing consulting, development of intermediary service organizations, and business model innovation should be supported to provide comprehensive and professional services such as strategic research, planning, corporate diagnosis, and solutions for manufacturing enterprises. Furthermore, the service platforms in the fields of information, research and development, training, consulting, and intellectual property should be constructed to solve common issues such as general standard formulation, service value measurement and intellectual property protection.

(2) Building a good market environment for service-oriented manufacturing. The upgrading of demand-side consumption and the transformation from product consumption to service consumption should be promoted. The access threshold for manufacturing enterprises should be broadened to expand their services, and facilitate to develop value-added services based on the existing products. Furthermore, the quantifiable and evaluable manufacturing service quality standards should be prepared; inclusive and prudent supervision of new service-oriented manufacturing business should be implemented; the protection of intellectual property rights of service products should be strengthened.

(3) Optimization of resource allocation for service-oriented manufacturing. The decisive role of market in allocation of industrial resources should be exerted, and imbalance of regional structure, industrial structure, market structure, enterprise structure should be adjusted according to the laws of market economy to effectively solve the problems of blind investment decision-making, industrial structure convergence, and market disorder competition. The guiding role of the government in allocation of industrial resources should be better played, and the industrial elements such as capital, technologies, and talents should be transferred to high-end services of the manufacturing industry; the industrial resources should be attracted to high-value, high-return service-oriented manufacturing, so as to promote the development of related industries, and improve the efficiency, effectiveness, efficacy and benefits of industrial resource allocation.

(4) Promotion of the transformation of manufacturing to service-oriented manufacturing. The service-oriented manufacturing enterprise cultivation plan should be implemented, and the classified guidance of manufacturing enterprises with transformation capabilities and conditions should be strengthened. The manufacturing enterprises should be encouraged to carry out value-added services based on product
design such as industrial design, based on the improvement of product efficiency such as product life cycle management, based on the convenience of product transactions such as supply chain finance, and based on product integration such as customer-oriented general integration and general contracting; furthermore, the product-based services should be transferred to demand-based services.

(5) Improvement of the policy system of service-oriented manufacturing. An industrial policy system promoting the integration of manufacturing services should be established, and the policy differences regarding of prices in taxation, finance, technology, land use, and electricity between the service industry and manufacturing industry should be eliminated. The policies regarding government procurement and import substitution should be improved and implemented, and the government service procurement policies complying with international rules should be formulated, so as to introduce social capital to service-oriented manufacturing, and participate in service-oriented transformation of manufacturing enterprises and the innovation of service-oriented manufacturing mode.

(6) Summary and promotion of demonstration enterprises and typical cases. A batch of pilot projects of service-oriented manufacturing enterprises should be selected, and attention must be attached to the promotion of service-oriented manufacturing enterprises for upgrading the development mode based on advanced industrial base and modernized industrial chain. The “bottleneck” constraints in basic technology, basic software, basic equipment, basic materials, and basic parts and components should be resolved. The methods for constructing national service-oriented manufacturing demonstration bases, demonstration areas and demonstration cities should be summarized in combination with the overall strategy of national and regional development.

5 Promotion of the development of service-oriented manufacturing clusters

(1) Selection of key regions for creating service-oriented manufacturing clusters. Attention must be attached to the national regional development strategy and national key industry layout. The service-oriented manufacturing clusters or sharing economic belts with outstanding location advantages, significant results of integration of manufacturing services, and complete supporting services in areas with a better manufacturing foundation to improve the regional manufacturing industry value chain. The development of key industrial clusters must integrate and build a cross-regional and cross-industry innovation network to facilitate the rational division of labor based on agglomeration and effective flow of innovative elements, thereby improving the scale economies effect, structure economies effect, and space economies effect.

(2) Development of high-tech manufacturing and knowledge-intensive service industries. The research and development of advanced manufacturing technologies and core technologies should be strengthened to promote the development of service-oriented manufacturing to the high-end and intelligent direction. The development of knowledge-intensive service industry should be oriented towards service-oriented manufacturing to expand the service fields and accelerate intellectual cycle of knowledge production, exchange, circulation and distribution. A number of high-tech manufacturing and knowledge-intensive service bases should be constructed focusing on national strategic emerging industries, and relying on national independent innovation demonstration zones and high-tech industry development zones.

(3) Improvement of demonstration and leading effect of leading enterprises. The leading manufacturing enterprises and producer service industry leaders in the industrial clusters should be encouraged to enter the service-oriented manufacturing to create a service-oriented manufacturing network based on specific manufacturing fields and industrial supply chain. The collaborative manufacturing capabilities and efficiency of the upstream and downstream industrial chains should be improved to form good ecosystem of collaborative R&D, manufacturing, and service among large, medium and small enterprises on the basis of a cloud-based service platform. The leading effect on SMEs in the clusters should be enhanced to cultivate a group of specialized, industrialized, refined, distinctive, and innovative “little giants.”

(4) Strengthening of the construction and application of industrial Internet platforms. The use of new network technologies such as 5G should be facilitated to transform the industrial Internet, and meet the requirements of intelligent manufacturing for low-latency, high-reliability, and wide-coverage networks. A service-oriented manufacturing network cluster with shared platform data, open sources of software, and extensive participation of enterprises and users should be constructed based on the aggregation of industrial Internet platforms and connection of enterprises at upstream and downstream of the supply chain. It is essential to promote value discovery and service model innovation based on industrial Internet and manufacturing big data, and strengthen the docking of innovation achievements with industries and innovation projects with actual productivity.

(5) Acceleration of transformation and upgrading of traditional industries by high and new technologies. The “Four New Basics” construction centered on automatic control and perception, industrial core software, industrial Internet, industrial cloud and intelligent service platforms should be strengthened to guide and apply digital technology and intelligent technology in key links of traditional manufacturing. The big data analysis and integration, operation process reorganization, resource allocation optimization, and business model reconstruction should be used to help the manufacturing industry to complete the intelligent and service-oriented transformation, thus driving the development of many new technologies, new products and new equipment.
(6) Creation of new business forms and new modes of development of service-oriented manufacturing industry clusters. New business formats and new modes based on big data of manufacturing should be created relying on digital platforms such as the industrial Internet and manufacturing service industry clusters, and facing the needs of all links in the manufacturing industry chain to develop new industrial design services such as crowdsourcing design, participation of users in design, cloud design, collaborative design, and open source design, as well as new manufacturing service modes such as personalized customized production, intelligent manufacturing, full life cycle management, and financial leasing. The widespread application of digital technology service modes such as infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS) should be promoted.

6 Improvement of international competitiveness of service-oriented manufacturing enterprises

(1) Guarantee of the safety of service-oriented manufacturing industry chain and supply chain. The policies and measures must be prepared for effectively resolving the restrictions of Western countries on technology export, investment mergers and acquisitions, industrial development, scientific and technological cooperation, and personnel exchange in China. The monitoring and analysis of the changes in key industries, key products, and key countries and regions should be strengthened; the early warning model system and rapid response mechanism should be improved; the early warning information should be timely released. The safety early warning mechanism and safety early warning database should be constructed to give full play to the leading role of industry associations in safety early warning. Particular attention should be attached to the prevention of the risks of overseas investment, futures trading, listing and financing, exchange rate changes, and international settlement.

(2) Strengthening of comprehensive evaluation on multinational operations of service-oriented manufacturing enterprises. The following six kinds of capacities are mainly involved in the evaluation: ① operation and development capacity, which mainly reflects the capacity of scientific management and sustainable development of enterprises; ② capacity of gaining return on investment, which mainly shows the capacity of enterprises for obtaining income through effective operation and investment activities; ③ risk prevention and control capability, which mainly indicates the capacity of enterprises for preventing, responding and enduring various risks in the business process; ④ technical innovation capability, which mainly suggests the capacity of enterprises for gaining income and consolidating market position through technological innovation, technological transformation, and digital transformation; ⑤ capital gain capability, which mainly denotes the capacity of enterprises for improving the business scale, quality and efficiency through continuous accumulation and reinvestment of capital; ⑥ social responsibility capacity, which mainly represents the capacity of enterprises for fulfilling legal obligations, economic responsibilities and providing public interests.

(3) Benchmarking between service-oriented manufacturing enterprises and international counterparts. The following benchmarking actions should be completed: R&D design level, manufacturing technology level, and management technology level; application of new technologies, new processes, new products, and new materials; input-output, resource optimization, integrated innovation, and process reengineering; possession and practice of competitive advantages in technology, brand, standards, quality and service. The gaps should be identified and the measures should be determined to reach the target through benchmarking.

(4) Expansion of the channels for international cooperation and intelligence introduction in the field of service-oriented manufacturing. The open economy should be transferred from factor-driving to innovation-driving, and “bringing in” should be better combined with “going out.” The introduction of investment, intelligence, and technology should be well planned, and the global technology chain, industry chain, innovation chain, and value chain should be deeply integrated. Efforts should be made to improve the level of construction of international science and technology centers in Beijing, Shanghai, and Guangdong-Hong Kong-Macao Greater Bay Area, thus constructing a global distribution center for innovative elements and an international scientific and technological innovation hub. The skilled immigration policy, intelligence introduction policy and talent visa policy with Chinese characteristics should be implemented.

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