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Exploration of Xi Jinping's Core Technology Perspective

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Abstract:

Xi Jinping's perspective on core technology is grounded in theoretical, historical, and practical foundations. Theoretically, it reflects the critical elements of Marxist thought on technology; historically, the progression of industrial revolutions demonstrates that core technology determines a nation's scientific and technological power and the destiny of its people. Practically, mastering key core technologies is essential for seizing the initiative in development, both as an urgent need and a practical requirement. Xi Jinping elucidates the fourfold nature of core technology from an ontological perspective, clarifies its four strategic values from an axiological perspective, and outlines four key focal points for achieving breakthroughs in core technology from a methodological perspective.

Keywords: *Core Technology; Ontology; Axiology; Methodology.*

I. The Three Foundations of Xi Jinping's Core Technology Perspective:

Using Xi Jinping's core technology perspective to articulate his significant discourses on core technology serves to deepen and elevate his key remarks. Xi's perspective on core technology rests on theoretical, historical, and practical foundations.

1.1 Theoretical Foundation: The Core Technology Perspective as an Important Reflection of Marxist Technological Thought:

Liu Dachun states, "Although there is academic debate over whether Marx developed a philosophy of science or technology, Marx's thought on science and technology undoubtedly exists and is profound, with a realistic and deeply insightful view on technology" (Liu, 2017). As founders of Marxism, Marx and Engels integrated technological thought as part of their science and technology theories, making Marxist technological thought undeniably existent. Acknowledging the profound impact of core technologies on technological revolutions and economic-social transformations, classical Marxist theorists and their successors were attuned to this influence, focusing on the key technologies characteristic of various historical periods. In examining technologies from different eras, they addressed these key technologies, forming the Marxist

perspective on core technology. This represents an essential expression of Marxist technological thought, laying the theoretical groundwork for Xi Jinping's perspective on core technology.

Although Marx did not directly use the term "core technology", he and Engels used Fourier's term "pivot" to refer to inventions that define the technological and economic nature of their respective periods, highlighting their transformative impact on production methods and social relations. For Marx, China's three ancient inventions-gunpowder, the compass, and printing-were monumental achievements that served as "pivots" of the handcraft era, foreshadowing the coming of capitalist society. Similarly, the machine systems comprised of engines, machine tools, and transmissions represented the "pivot" of modern industrial production. Marx regarded machine tools as the "starting point of the eighteenth-century Industrial Revolution" (Marx & Engels, 2012) and James Watt's double-acting steam engine as the "second revolution" (Marx, 1978). The creation of the machine tool necessitated steam power innovation, spurring a revolutionary transformation in production methods (Marx & Engels, 2012). Engels emphasized that Britain's Industrial Revolution, powered by a modern machine system, became the foundation of contemporary British society and drove its social momentum (Marx & Engels, 1995).

Since the founding of the People's Republic of China, facing the rapid advancement of the third scientific and industrial revolution, successive leadership collectives of the Central Committee of the Communist Party of China have underscored the significance of core technology for the nation and its people. For instance, Mao Zedong deemed the atomic bomb, a core technology in high-tech fields, as "fate-determining" (Huang & Wu, 2000), while Deng Xiaoping described it as a reflection of a nation's capabilities and a symbol of national prosperity and strength (Deng, 1994). Jiang Zemin and Hu Jintao directly referenced the term "core technology". Jiang Zemin identified microelectronics, computing, artificial intelligence, and communication as core technologies of informatization and intelligence (Xi, 2016), emphasizing that "striving to master core technologies" is essential to "occupying the high ground of technology" and securing "the fate of our nation's development and security" (Xi, 2016). Hu Jintao stressed that breaking through in core technology would allow China to "seize early opportunities for future development" (Xi, 2016). Confronted with a new round of technological and industrial revolutions, Xi Jinping has further enriched and developed the Marxist core technology perspective.

1.2 Historical Foundation: Core Technology Determines National Scientific Strength and the Destiny of a People:

Xi Jinping noted, "History is the authentic record of a people or a nation's formation, development, and prosperity or decline; it is the 'encyclopedia' of predecessors, a compendium of their knowledge, experience, and wisdom" (*Continuously Improving Historical Thinking Ability-Better Moving Towards the Future by Learning from the Past*, 2019). He takes history as a reference,

examining the mastery and breakthroughs in core technology within the context of human civilization. Drawing from over five thousand years of Chinese history, Xi analyzes both the positive and negative lessons learned to assess current and future development trajectories.

Xi Jinping observed that each industrial revolution has been inseparable from technological innovation, with each revolution propelling human civilization to higher levels. From the 18th to the late 20th century, the three industrial revolutions were triggered by technological breakthroughs: the first industrial revolution introduced the steam engine, ushering in the era of mechanization; the second introduced electricity and chemistry, leading to the age of electrification, atomic energy, and aerospace; the third introduced information technology, bringing automation and intelligence.

From China's five-thousand-year history, Xi highlights that technological strength shapes the fate of a nation. Before the 16th century, China's leading status and profound influence on global civilization stemmed from significant inventions like papermaking, gunpowder, printing, and the compass. However, following the Opium War, China suffered due to its missed opportunities in global technological and industrial revolutions, resulting in technological backwardness. Since the founding of the People's Republic, China's emergence as a globally influential nation and its approach toward national rejuvenation are largely attributed to its alignment with global scientific trends. China has achieved a series of critical technological milestones, including the "Two Bombs, One Satellite", manned spaceflight, lunar exploration, quantum communication, and the BeiDou Navigation Satellite System.

These key core technologies-from the "Four Great Inventions" of ancient China to the foundational inventions sparking three industrial revolutions, as well as technological achievements made since the founding of the People's Republic-have driven transformations in social productivity and advanced human civilization in various historical contexts. Chinese history demonstrates that during periods when China mastered core technologies in crucial fields, the nation's technological strength was high, and it thrived; conversely, weakened technological strength led to adversity. The histories of other nations, particularly the contrasting trajectories of Eastern and Western civilizations, also underscore that a nation's scientific and technological strength-and its destiny-depends significantly on its capacity to master key core technologies. Breakthroughs in "choke-point" core technologies represent landmark scientific achievements and are pivotal to a nation's technological strength. A nation's scientific capability and destiny are therefore shaped by its ability to align with global technological trends, seize opportunities, and command core technologies driving scientific and industrial revolutions.

It is precisely based on the intrinsic historical logic linking core technology to national strength and destiny that, in response to the wave of scientific and industrial revolutions currently underway, Xi Jinping emphasized in a speech to the national academies that "science and technology

have never so profoundly impacted a nation's destiny as they do today". He underscored that realizing the Chinese Dream and national rejuvenation requires a robust scientific and technological foundation, which entails breaking through "choke-point" core technologies.

1.3 Practical Foundation: Mastering Key Core Technologies is Imperative for Gaining Developmental Initiative and Meeting Practical Demands:

Xi Jinping's core technology perspective arises from the assessment of a new wave of scientific and industrial revolutions and addresses the reality that "the pattern of dependence on others in core technologies within critical areas has not fundamentally changed". It also emerges from recognizing the substantial risk posed by China's reliance on foreign core technologies.

Since the 18th National Congress of the CPC, China has achieved breakthroughs in certain key areas of core technology, such as pen tips, the train control system (known as the "brain and central nervous system" of high-speed rail), and 5G new air interface wireless technology. However, many core technologies still elude China, leaving the supply chain's "life gate" in others' hands. Following the ZTE incident in April 2018, *Science and Technology Daily* identified 29 core technologies across various industries urgently in need of breakthroughs in China. This reality is one that Xi Jinping has repeatedly highlighted: overall, the structure of "dependence on others in key areas of core technology has not fundamentally changed", and this reliance remains a significant risk to China's scientific development.

The ZTE incident and subsequent U.S. technology sanctions against Huawei exposed the serious vulnerabilities of foreign dependence in core technology for the survival and growth of Chinese enterprises and highlighted the risks to China's competitive edge in science and technology. These events also made the nation acutely aware of the pain points associated with relying on foreign core technology. In practical terms, dependence on foreign core technology means that Chinese enterprises, and even the country's technological and industrial competitiveness, are constrained by others. As Xi Jinping articulated, core technology is China's "greatest life gate", and mastering it is essential for China to gain the initiative in global competition and development.

How can China achieve autonomy in core technology, fundamentally changing the dependency pattern in key fields? This question is central to Xi Jinping's core technology perspective and one he aims to analyze and resolve.

II. The Three Dimensions of Xi Jinping's Core Technology Perspective:

Xi Jinping employs scientific methods to analyze and address three critical questions from the perspectives of ontology, axiology, and methodology: what is core technology, what is its strategic significance, and how can core technology breakthroughs be achieved?

2.1 Ontological Dimension: The Fourfold Nature of Core Technology:

Guided by the question, "What is core technology?" Xi Jinping employs strategic and

systemic thinking to delineate the fourfold nature of core technology, establishing clear boundaries between core and non-core technology.

Xi Jinping asserts that "strategic issues are fundamental for a political party and a nation. Accurate strategic judgments, scientific strategic planning, and proactive strategic actions will bring great hope to the Party's and people's cause" (*Strategic Thinking: Political Wisdom to Create a New Situation*, 2017). Whether forming a fundamental safeguard for national security and military strategy or securing dominance in international technology competition and industrial development, core technology serves as the "anchor of stability" and "indispensable tool" (Xi Jinping inspects CAS: *Implementing the Strategy of Innovation-Driven Development*, 2013). It is an invaluable "national asset", possessing strategic value and significance, which cannot be bought with money nor acquired through dependence on others; self-reliance is essential, with no illusions about purchasing or importing it.

However, the reality of China's overall technological gap with developed countries remains undeniable. How can China catch up to international standards? Xi Jinping proposes an "asymmetric leapfrogging strategy" (Xi, 2016), emphasizing the need for strategic clarity, unconventional thinking, leveraging strengths, and prioritizing critical choke points. In fields where core technologies are unattainable by 2050, he recommends "studying asymmetric measures" (Xi, 2016), crafting disruptive "killer technologies" to gain a significant advantage and achieve an asymmetric effect. For Xi Jinping, such "asymmetric technologies" and "killer technologies" are also part of "core technology" (People-centered: *Let the People Use it Well*, 2016).

Moreover, Xi Jinping repeatedly emphasizes the application of systemic thinking, which entails "guiding principles of systems theory to understand issues by examining the interconnections and interactions within and among systems, addressing relationships between the whole and parts, and structure and function" (Wu, 2017). First, at the level of systems and elements, regardless of the system's components and their interrelations, a core set of "axiomatic" elements within that system provides foundational functionality. For example, the modern computer system, comprising hardware and software, relies on the kernel as the core element of its operating system-a "foundational technology" and "universal technology" (People-centered: *Let the People Use it Well*, 2016). Xi Jinping classifies such technologies as "core technologies".

Second, at the level of systems and environment, dynamic systems require control and guidance mechanisms to maintain stability in complex, evolving environments. In the new wave of technology and industrial revolution, the boundaries of information technology are extending from traditional computing and telecommunications to big data, cloud computing, mobile internet, and the convergence of new information technology with artificial intelligence (AI) and real economy. Humanity is experiencing an "information revolution" aimed at "enhancing cognitive capabilities",

representing a leap in productivity with profound effects on global politics, economy, culture, society, ecology, and military (Xi, 2016). The new generation of information technology has become "the leading technology that permeates every aspect of economic and social life" (Xi, 2014), serving as the information "artery" for economic and social development. AI is an emerging strategic technology and a new focus of international competition, and the "R&D, manufacturing, and application" of AI have become indicators of a nation's scientific innovation and high-end manufacturing. In all aspects and sectors of contemporary society, new information technology, AI, and intelligent robotics represent "key generic, frontier-leading, and disruptive technologies" with forward-looking, pioneering, and exploratory qualities, regulating and guiding the various parts of the social system. Consequently, Xi Jinping regards these "frontier and disruptive technologies" as part of "core technology" (People-centered: *Let the People Use it Well*, 2016).

2.2 Axiological Dimension: The Fourfold Strategic Significance of Mastering Core Technology

Xi Jinping outlines four strategic benefits of mastering core technology.

First, historical experiences from the rise of Western powers suggest that mastering core technology can enhance China's scientific and technological strength and help build it into a global scientific and technological power. As previously mentioned, a country's technological strength, and whether it qualifies as a global leader in technology, is defined by its ability to overcome critical choke points and master high-end technology, thereby becoming a leader in significant scientific fields and a pioneer in emerging interdisciplinary areas. Furthermore, the interplay between industrial and technological revolutions demonstrates that the key technologies driving the three industrial revolutions-the steam engine, electricity and chemistry, and information technology-are the defining technologies of their respective eras. Western countries have often risen to global dominance by seizing the opportunities presented by technological and industrial revolutions. For instance, Britain's global dominance from the 18th to mid-19th centuries was due to its early mastery of the core technology of the first industrial revolution, establishing itself as a leader in mechanical innovation and ushering humanity into the age of mechanization. Germany's global prominence from the late 19th century to the early 1940s arose from its discovery of new methods that connected "abstract knowledge and technological progress", making it a leader in electricity and chemical industries and advancing humanity into the electrification age. The United States' dominance from the mid-20th century onward was due to its mastery of core technologies from the third industrial revolution, establishing itself as the leader in information technology and ushering humanity into the automation and intelligence age. To build a global technological power, China must seize the new wave of technological and industrial revolutions, achieving breakthroughs in vital and emerging frontier technologies to become a leader and pioneer.

Second, understanding the rules of international competition reveals that mastering core

technology enables China to gain the high ground and initiative in global technological and economic competition. After identifying these competitive principles, Xi Jinping elaborated on how to leverage them for strategic advantage. "International competition has always been a race against time and speed" (Central Committee of the Communist Party of China Document Office, 2016). Thus, to secure the high ground in international technological and economic competition, China must promote independent innovation, "identifying trends early","acting swiftly", and "planning proactively". Additionally, it must participate in or lead the creation of new global industrial and economic competition arenas, becoming a key rule-maker and main player. For Chinese enterprises, participating in traditional international competitive fields means accepting pre-established rules set by global giants. However, the emerging wave of technological and industrial revolutions offers a historic opportunity, as global supply chains and economic structures are likely to be reshaped. If China seizes this opportunity, building the capacity to participate in or lead the establishment of new arenas, it can achieve a dominant position in international competition. This shift requires moving away from following others' lead and focusing on proactive technological innovation and overcoming choke points in industrial upgrades. For example, Microsoft and Intel formed the "Wintel" alliance, combining their respective technological strengths to establish technical standards in the PC industry, replacing the PowerPC alliance of Apple, IBM, and Motorola to become industry leaders. Given China's technological gap with developed countries, Xi Jinping advocates for an "asymmetric leapfrogging strategy" to leverage strengths in areas that developed nations are unlikely to reach by 2050 (Xi, 2016).

Third, from the perspective of the current technological status and consequences for Chinese internet companies, mastering core technology is essential for national security across various domains. Currently, despite progress, Chinese internet companies still face significant technological gaps compared to global leaders, with the most critical shortfall in core technology. Foreign dependence on essential components leaves China's supply chain vulnerable. Thus, Xi Jinping underscores that core internet technology represents China's greatest "life gate", with foreign reliance posing the most serious risk. Metaphorically, if core technology is in foreign hands, it is akin to building on another's foundation-no matter how grand, it risks collapse in the face of adversity (Technological Breakthroughs Require Abandoning Illusions and Relying on Ourselves, 2016, April 26). The 2018 ZTE incident strongly affirmed this viewpoint. In the information and intelligence age, economic security, national defense, and all aspects of national security depend on cybersecurity, which in turn requires robust core information technology. In Xi's view, "Without cybersecurity, there is no national security, no stable operation of the economy, and the interests of the people are difficult to protect". Consequently, Xi believes it is necessary to "accelerate breakthroughs in core information technology" (Speech at the National Cybersecurity and

Informatization Work Conference, 2016, April 25).

Fourth, from China's painful modern history and the current historical opportunity, mastering core technology is crucial to achieving the Chinese Dream. Xi Jinping emphasizes that technology is the foundation of national strength, and breakthroughs in core technologies are the hallmark of a world-leading scientific power. In his view, China's position as a major global power in ancient times was due to its technological achievements, such as the Four Great Inventions. However, following the Ming dynasty, China missed significant technological revolutions, resulting in a prolonged period of vulnerability. Following the Opium War, China endured a bleak period, and the goal of national rejuvenation became the greatest aspiration of the Chinese people. Xi stressed, "We are closer to achieving national rejuvenation than ever before, and we need to build a global technological power more than ever". Now, as the world undergoes a new wave of technological and industrial transformations and enters an information-driven economic development era, Xi Jinping believes, "Information technology has brought the Chinese people an unprecedented opportunity; we must seize this opportunity with vision" to "drive breakthroughs in core information technology, leveraging information technology to lead economic and social development" (Speech at the National Cybersecurity and Informatization Work Conference, 2016, April 25).

2.3 Methodological Dimension: Four Key Focal Points for Achieving Breakthroughs in Core Technology

In response to the rise of a new wave of technological and industrial revolutions that are ushering the world into an information-based economy, Xi Jinping outlines the pathway to achieving breakthroughs in core technology, focusing on information technology. His methodology emphasizes four focal points:

Firstly, balancing independent innovation with open innovation. Currently, two contrasting approaches exist regarding technological development: one advocates for self-reliance, while the other emphasizes openness. Xi Jinping contends that each approach "holds certain truths", but that neither is dialectical. He advocates a balanced approach between independence and openness. Recent technological embargoes against several Chinese companies demonstrate the need for self-reliance in critical core technologies. Xi even states that "independent innovation is the only path to reach the summit of global technology" (Technological Breakthroughs Require Abandoning Illusions and Relying on Ourselves, 2016, April 26), since core technology represents a "national asset" that cannot be bought or traded. However, independence does not imply isolation. As early as the 19th century, Marx observed that "Few 18th-century inventions belonged solely to one individual" (Marx & Engels, 1975). In the 21st century, with an increasingly interconnected global community, few new technologies are the product of one nation alone. Thus, in core technology development, Xi stresses the importance of a global perspective and an open approach, "drawing talent and resources

from around the world" (Speech at the 19th Academician Conference of the Chinese Academy of Sciences and the 14th Academician Conference of the Chinese Academy of Engineering, 2018, May 29). Recognizing the universal and contemporary nature of new technology, China should adopt an open-minded approach, accepting and adapting foreign technology to foster innovation.

Secondly, focusing resources to achieve strategic goals in scientific research. Xi's observation of core technology development in recent years reveals a significant challenge-resources are often not allocated to priority areas. Despite substantial investments, results are sometimes limited. To address this, Xi advocates for "targeted investment in key areas", tightly focusing efforts on essential breakthroughs.

Thirdly, balancing foundational research with applied technology and industrialization. Promoting the transformation and commercialization of core technological achievements is crucial. From the global information technology perspective, the integration of the innovation chain, industrial chain, and value chain is essential for success. Xi emphasizes a "dual drive of technological and institutional innovation" (Speech at the 19th Academician Conference of the Chinese Academy of Sciences and the 14th Academician Conference of the Chinese Academy of Engineering, 2018, May 29), addressing both technology-related and external issues. In terms of the technology itself, core technology research must not be isolated from these three chains, and its results should not be limited to reports, papers, or prototypes but must extend to marketable products, technological capabilities, and industrial strength. Externally, Xi highlights the need for reforms to the scientific system to address institutional and structural obstacles that hinder the commercialization and industrialization of core technological advancements.

Fourthly, fostering collaboration and strong alliances. A review of international internet giants reveals a common pattern in their success-effective partnerships in core technology R&D that generate synergistic benefits. For example, Microsoft and Intel's "Wintel" alliance established a "duopoly" in the global PC industry; Apple and Google's mobile advertising alliance allowed them to dominate the mobile and tablet markets; Qualcomm and Android formed the "Quadroid" alliance, rapidly gaining ground in the smartphone market. In light of this, Xi emphasizes that, in the new wave of technological and industrial revolutions, China must leverage the strengths of both state-owned and private enterprises, forming industry-academia-research alliances. He advocates creating closer capital cooperation mechanisms by establishing core technology R&D investment companies, allowing upstream enterprises to drive downstream innovation. This approach addresses challenges both in the application of upstream technology and the "lack of core" in downstream industries.

In conclusion, Xi Jinping's core technology perspective deepens and expands Marxist thought on technology, drawing on millennia of Chinese history, and serves as a practical guide for China to command core technologies and secure competitive and developmental advantages in the

modern era. It stands as a fundamental principle for China's journey to the forefront of global technology and its ascent to higher positions in global industrial chains.

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