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Mechanisms and Identification of New Quality Productivity Driving Social Evolution: Based on Qualitative Change in Relations of Production

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Abstract

New Quality Productivity (NQP), which centers on disruptive technologies, is reshaping socioeconomic structures across the board. Existing studies concentrate on its technological features; few examine how it drives social evolution through shifts in relations of production. This paper takes qualitative change in relations of production as its analytical framework and the transformation of ownership of the means of production as the core criterion. Tracing the historical record from the Stone Age to the Information Revolution, the study finds that NQP attains complete qualitative change only when technological revolutions set off fundamental breakthroughs in ownership. For frontier technologies such as artificial intelligence and quantum computing, the capacity for qualitative transformation rests on institutional choices: if new means of production stay monopolized by capital, progress remains confined to partial qualitative change, whereas institutional innovation that builds a new form of public ownership can carry social formation forward. The paper offers an analytical framework for deepening the political-economy reading of NQP and a reference for judging where social evolution is headed in the age of intelligent civilization.

Keywords

New Quality Productivity, Relations of Production, Ownership of the Means of Production, Evolution of Social Formation.

1. Introduction

A new round of scientific and technological revolution, led by artificial intelligence, quantum computing, and bioengineering, is currently speeding up the intelligent reorganization of production factors and, at the same time, stirring tensions in the evolution of social formation. NQP has consequently become a central topic in both academic research and policy-making, and has been folded into the strategy of Chinese-style modernization. The concept, which was proposed by General Secretary Xi Jinping, names an advanced qualitative state of productivity: one that is innovation-led, breaks from traditional growth paths, and carries high technology, high efficiency, and high quality, in line with the new development philosophy [1]. To lift the concept out of its Chinese setting and turn it into a general category spanning history and geography, the decisive move is to grasp its core of qualitative change—namely, the fundamental transformation of existing modes of labor. Current definitions of qualitative change split into two schools. The factor-expansion school stresses the rise of new laborers, new instruments of labor, and new objects of labor [2]; the function-oriented school looks to outcome characteristics such as gains in total factor productivity [3] and the realization of intergenerational ecological justice [4].

Neither school has dealt adequately with relations of production, above all with the fundamental transformation of ownership of the means of production. The qualitative change of NQP shows up in three aspects of relations of production: structural innovation in ownership,

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the rebuilding of relations among production subjects, and institutional breakthroughs in distribution. A change in one or two of these aspects counts as a partial qualitative change; a change in all three counts as complete. Ownership holds the foundational position within these three aspects, and its transformation ultimately drives the other two, so the nature of qualitative change should be judged first and foremost by ownership. Existing studies mostly stop at partial adjustments to subject relations and distribution modes [5], which amount to no more than quantitative accumulation in social evolution; the mechanisms behind a fundamental transformation of ownership remain largely under-explored. This paper, therefore, builds a discriminant framework that proceeds through theoretical construction, historical verification, and contemporary examination. Specifically, it asks why some technological revolutions catalyze complete qualitative change in social formation while others yield only partial change, and how NQP drives social evolution and how that process can be identified.

2. Theoretical Foundations of NQP Driving Social Evolution

2.1. Theoretical Foundation: Productive Forces as the Ultimate Determining Force of Social Evolution

2.1.1. Sub-section Headings

From the Marxist perspective, productive forces consist of three elements: laborers, instruments of labor, and objects of labor. Their growth is not only the source of material wealth; it is also the fundamental force behind the evolution of social formation. Once productive forces reach a certain historical stage, they clash with the existing relations of production, which turn from forms of development into fetters of constraint, and an era of social revolution begins. Marx did not list science and technology as an independent element, yet they nonetheless become the primary force of social development by sharpening laborers' skills, revolutionizing instruments of labor, and widening objects of labor. Existing theory, though, does not separate the evolutionary functions of different technologies. Some technologies can set off scientific-technological revolutions and drive leaps in social formation; others only raise efficiency and leave existing structures intact. This gap is precisely the scholarly space in which the concept of NQP could be proposed in the first place.

2.2. Transmission Mechanism: The Logical Chain of NQP Driving Social Evolution

In essence, NQP does not drive social evolution through a one-dimensional technological boost alone; it works through a complete chain of factor upgrading, institutional adaptation, and formation leap. The first link is the systematic upgrading of the three elements of productive forces. Unlike the partial improvements of traditional productive forces, NQP takes high-tech innovation as its core and transforms the connotation, function, and interaction of the three elements in a comprehensive way: upgraded labor skills support the advanced application of instruments of labor; the iteration of instruments of labor in turn lifts skills further; and the widening of objects of labor opens new scenes for their interaction. The result is a new productive-force system marked by high technology, high efficiency, and high quality, which in turn supplies the material basis for the adaptive reconstruction of relations of production.

The second link is the adaptive reconstruction of relations of production. Upgraded productive forces necessarily call for matching adjustments in ownership forms, modes of labor organization, and methods of distribution. The process runs on an evolutionary logic—productive forces upgrade, contradictions surface, institutions innovate, and a new balance is reached—and it keeps moving as productive forces iterate. When contradictions appear in new forms, relations of production are adjusted again, advancing step by step toward higher-level

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forms as the contradictions are resolved and, in return, empowering productive forces in their further development.

The third link is the multi-level transmission of a leap in social formation. The transmission starts from the economic base by transforming the industrial structure and the development modes, and then it starts to transform the superstructure by transforming the political institutions and the governance systems. Meanwhile, it reshapes the social structure and the social relations in order to, in the end, promote the civilizational form and to bring about a progressive change within the economic base, the superstructure, the social structure, and the civilizational form.

2.3. Core Criterion: The Qualitative Change Discrimination Framework for NQP

To determine the stage-specific character of social evolution, two levels need to be examined. At the level of productive forces, the question is whether a new technology has changed humanity's capacity to transform nature. A technology that brings only marginal gains in efficiency leaves the relations of production largely untouched, and social evolution stays at the stage of quantitative accumulation; one that sets off a systemic qualitative change in the three elements (laborers, instruments of labor, and objects of labor) exerts strong pressure on existing relations of production and gives social evolution breakthrough momentum. At the level of relations of production, the question is how the ownership of the means of production, relations among people, and the mode of distributing products are adjusted, and this is the ultimate basis of judgment. The two levels depend on each other: the first supplies the material impetus for the second, while the second in turn constrains or releases the potential of the first.

The transformation can be broken down into five dimensions. The first is the revolutionary nature of technological generations, whether the technological paradigm itself has undergone a fundamental upheaval, which serves as the initiator of qualitative change. The second is the systemic upgrading of factors of production, that is, whether technological breakthroughs have translated into an overall leap in the three factors of production. The third is structural innovation in ownership, that is, whether the allocation of property rights of the core means of production has undergone a fundamental transformation. The fourth is the restructuring of relations among production subjects, covering whether the labor process has grown more democratic, whether decision-making has been decentralized, and whether the human-machine relationship has shifted from substitution to symbiosis. The fifth is the institutional breakthrough in distribution methods, namely whether the single model of distribution based primarily on capital has been broken down and a diversified distribution model has been adopted.

The five dimensions are not of equal standing. Ownership determines the fundamental nature of relations of production and, beyond that, the basic type of social formation, so structural innovation in ownership is the core indicator for identifying complete qualitative change. Adjustments to subject relations and distribution modes that leave ownership untouched amount to partial qualitative change: they can improve efficiency and restructure industries, but the fundamental nature of the social formation persists. Only when subject relations and distribution modes undergo a thorough qualitative change built on ownership innovation does complete qualitative change occur, and social formation enters a higher stage.

3. Historical Verification of NQP Driving Social Evolution

3.1. Scientific-Technological Revolution: The Underlying Logic of Social Formation Evolution

The evolution of social formation follows a recurring pattern: a technological paradigm revolution gives rise to advanced productive forces, which then compel a reconstruction of

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relations of production and a leap in social formation. The creative destruction of scientific-technological revolution runs through the whole of human civilization. From stone tools and bronze to iron implements and steam power, each such paradigm revolution reshapes factor combinations and institutional frameworks and drives social formation upward in stages. The faster technology changes, the wider the lag between it and existing institutions grows, and the more readily that lag becomes a new focal point of contemporary social contradictions.

3.2. Empirical Verification in Typical Historical Stages

3.2.1. Stone Tools and Fire

Although flint tools of the Paleolithic Era were limited in efficiency, combined with fire, they gave humans an initial capacity to transform nature and produced primitive relations of production based on public ownership of the means of production. The absence of marked wealth disparity in the burials at the Zhoukoudian site points to this [6]. Technology, relations of production, and social formation evolved together here, which is why stone tools and fire can reasonably be counted as NQP.

3.2.2. Bronze Agricultural Implements

Bronze agricultural implements and irrigation systems triggered a sudden mutation in the elements of productive forces: the differentiation between farmers and craftsmen emerged, and domesticated crops and specialized implements appeared. Private ownership of the means of production replaced clan public ownership; surplus products bred a slave-owning class, and slaves themselves became a core means of production. The Code of Hammurabi reflects the establishment of a hierarchical distribution system [7], and city-states replaced tribal confederations [8]. Although bone tools improved in efficiency over the same period, they left relations of production untouched and can only be seen as advanced productive forces. Bronze technology, by contrast, destroyed primitive public ownership and established class society, which amounted to a complete qualitative change.

3.2.3. Iron Tool Popularization

Iron agricultural implements were more durable than bronze and wooden tools, allowing hard land to be reclaimed and significantly improving efficiency in all stages of cultivation [9]. Human beings were no longer objectified as means of production, and land replaced labor as the core means of production. Farmers gained a certain degree of autonomy and retained part of their surplus products; the small-peasant economy became the social foundation [10], and slave society thus transitioned to feudal society.

3.2.4. The Steam Revolution

Watt's improved steam engine made large-scale use of fossil energy possible, and capital gradually replaced land as the core means of production. Through parliamentary reforms, the bourgeoisie won political dominance; capitalism triumphed over feudalism, and the global colonial system reshaped the international order [11]. This was a complete qualitative change.

3.2.5. Electricity and Information

Electrical technology sharply cut the cost of power generation, and Taylorism raised labor productivity, yet the essence of private ownership stayed the same [12]. The Information Revolution networked production organizations while widening the distribution gap between labor and capital [13], again without touching the foundations of capitalist ownership [14]. Both amount to partial qualitative change. They show that advanced productive forces can improve efficiency and postpone institutional crises, but they cannot on their own catalyze a fundamental leap in social formation.

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3.3. Historical Insights: Common Characteristics of NQP Driving Social Evolution

Historical examination reveals that prompting qualitative change in relations of production is the core hallmark of NQP: transformations in subject relations and distribution modes amount to partial qualitative change, whereas a fundamental transformation of ownership is the prerequisite for complete qualitative change. The discrimination must also take into account the relativity of qualitative change. The Soviet Union and China established socialist systems in a period when steam and electricity coexisted, so in those countries and at that specific stage, electrical technology can also be regarded as a complete qualitative change.

4. Analysis of NQP Driving Contemporary Social Evolution

Frontier technologies—artificial intelligence, quantum information, bioengineering, new energy, brain-computer interfaces, blockchain, the metaverse, and 3D printing—have broken through, or are breaking through, existing technological paradigms. Because they carry the attribute of prompting qualitative change in relations of production, they belong to the category of NQP.

4.1. Artificial Intelligence and the Intelligent Reconstruction of Relations of Production

Artificial intelligence is transforming the elements of productive forces in a systematic way: skill structures polarize, instruments of labor become intelligent, and objects of labor expand to include data. Whether this amounts to qualitative change, though, depends on how ownership of algorithms and data is allocated. If algorithm ownership is monopolized by a few capitals, artificial intelligence turns into a mere tool for reinforcing private ownership, making it difficult to transcend partial qualitative change [15]. If the non-exclusive, shareable character of intelligent technologies is put to use, and a new type of public ownership of algorithms and data is built through institutional innovation, a fairer, more open, and more collaborative mode of social organization becomes possible [16]. Artificial intelligence is thus both a window onto a technological paradigm revolution and an opportunity for the reconstruction of ownership.

4.2. Quantum Computing and Data Ownership Transformation

Quantum computing breaks through the physical limits of classical computing and brings instruments of labor into a quantum superposition state. Quantum secure communication is dismantling the traditional pattern of data monopoly [17]. As a core means of production, data is highly concentrated in the hands of a few digital capital entities, forming an intensified form of private data ownership. Under a quantum network architecture, data flow no longer depends on centralized key management and may regain the attribute of a public good; the right to distribute benefits is expected to shift toward society as a whole, providing a technical prerequisite for innovating public ownership of the means of production in the digital age. Technological maturity and supporting institutions, especially the allocation of computing power and the rules on data property rights, will decide whether this moves toward partial or complete qualitative change.

4.3. Bioengineering and Institutional Adaptation of Life Ethics

Gene editing and synthetic biology extend the objects of labor to the construction of life itself. They ease food and health problems while also imposing a threefold institutional constraint: public supervision over the right to modify life through technology, conflicts between gene patents and the public interest, and the ethical risks of turning life into a commodity [18]. At the bottom lies a structural contradiction between the development of productive forces and existing ownership forms and ethical norms. The potential for complete qualitative change can

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be released only by building a public governance framework for biological resources and bringing core means of production, such as genes, into a system of public ownership, co-governance, and shared benefits.

4.4. New Energy Technologies and the Evolution of Global Energy Governance Systems

Renewable energy, energy storage, and nuclear power are central to addressing climate change. The combination of distributed photovoltaics and smart grids may dismantle the monopoly of fossil-energy capital and give rise to an embryonic form of public energy ownership [19]. If nuclear fusion achieves commercialization, it will fundamentally change the economic logic of energy scarcity [20]. Left to the market alone, however, new energy would only become a supplement within the existing framework, so mandatory institutional intervention is required: carbon tax legislation, revision of energy law, and a reshaping of international governance can restructure the energy cost structure and promote equitable participation of the Global South in key technologies, critical minerals, and intellectual property rights, so as to catalyze a leap in the form of energy civilization.

4.5. Brain-Computer Interface Technology and the Expansion of New Objects of Labor

Brain-computer interfaces, by letting neural signals interact directly with machines, are breeding labor forms that escape physical constraints—brain-controlled exoskeletons running high-risk equipment, for example [21]—and may extend the objects of labor into the realm of consciousness. Reading brain signals, though, brings privacy leaks and identity crises. Whether its qualitative change is realized depends on whether society can put a neural-rights protection system in place before the technology spreads [22]: pinning down the public baseline of neural data, establishing neural sovereignty, and keeping capital from colonizing the realm of consciousness, while also exploring the socialized sharing of neural data.

4.6. Other Important Technologies, Cluster Synergy, and the Formation of NQP

Blockchain, the Metaverse, and 3D printing each challenge the centralized control of the means of production in different ways. Blockchain allows value to be transferred and rights to be verified or agreed upon by intermediaries via smart contracts and consensus mechanisms. The metaverse moves the field of labor from physical into virtual space, where laborers can cross physical boundaries to use virtual means of production together [23]. 3D printing disperses manufacturing capacity from centralized factories to communities and households; combined with open-source hardware and shared design platforms, it may mean that key manufacturing capabilities are no longer held exclusively by capital but shared by communities [24].

A single technological breakthrough can hardly catalyze a fundamental qualitative change in social formation on its own; complete qualitative change depends on the synergy of multiple technology clusters. The combination of artificial intelligence and quantum computing may break through computing-power bottlenecks and open space for public ownership of digital means of production [25]. The combination of blockchain and new energy can construct decentralized energy ownership [26]. The interaction between brain-computer interfaces and the metaverse frees labor from physical time and space and carries ownership questions into virtual space [27]. This multiplier effect of cluster coupling makes possible, at the system level, ownership changes that no single technology could trigger.

5. Conclusion

NQP driving social evolution is not a simple technological upgrade or a gain in efficiency; it is a staged transformation of social formation, set off ultimately by the systematic leap of the three

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elements and the adaptive reconstruction of relations of production. Working from the perspective of qualitative change in relations of production, this paper builds an analytical system that takes partial and complete qualitative change as its discriminant framework and ownership transformation as its core criterion.

Historical experience shows that NQP can make the leap from partial to complete qualitative change only when technological revolutions catalyze fundamental breakthroughs in ownership. From stone tools, bronze, and iron implements to steam power, every leap in social formation has had ownership transformation as its prerequisite. The electricity and information revolutions greatly improved efficiency, but they left the foundation of private ownership untouched and so remained at partial qualitative change.

Contemporary frontier technology clusters are showing the potential to transform ownership, but whether their qualitative change is realized depends on institutional choices, not on the technology itself. If new means of production such as algorithms, data, genes, and energy networks stay monopolized by capital, technological progress will still end in partial qualitative change. Only by building new forms of public or social ownership through institutional innovation can society move toward complete qualitative change.

References

[1] Xi, J. P. (2024). Developing new quality productive forces is an intrinsic requirement and an important focus for promoting high-quality development. Seeking Knowledge, (6), 4–6.

[2] Zhao, C. L. (2024). The innovative contributions of the new quality productive forces to Marx's productivity theory. China Review of Political Economy, 15(6), 115–130.

[3] Sun, Y. N., Liu, Y. W., Fu, N. H., & Zhu, L. Y. (2024). The growth patterns, regional disparity, and coordinated development of China's new quality productive forces. Journal of Finance and Economics, 50(6), 4–18, 33.

[4] Xie, H. M. (2025). Exploring the Marxist ecological philosophy implications of new quality productivity. Academic Search for Truth and Reality, (1), 45–53.

[5] Zhao, L., & Zhou, Z. J. (2025). Research on the theoretical connotation and realization path of new quality productivity. Frontiers in Humanities and Social Sciences, 5(3), 8–15.

[6] Wang, Z. S. (1955). A brief discussion on tombs. Archaeology, (1), 56–70, 16.

[7] Chen, X. (2018). A study on hierarchy in the ancient Babylonian period presented by "The Code of Hammurabi". Journal of Science and Education, (2), 161–162.

[8] Li, E. L., Cui, Z. Z., & Li, Y. T. (2020). Evolution of agricultural civilization in the Yellow River Basin based on the technology-economic paradigm. Resources Science, 42(1), 20–28.

[9] Wang, B. Q. (2004). Iron farm tools: Their emergence, development, and influences. Journal of Nanjing Agricultural University (Social Sciences Edition), (3), 83–86, 93.

[10] Yang, X. Z. (1982). The feudal autocratic system and the small-peasant economy. Literature, History, and Philosophy, (2), 55–59.

[11] Sachs, J. D. (2017). Globalization—In the name of which freedom? Humanistic Management Journal, 1(2), 237–252.

[12] Song, J. (2023). The evolution and predicament of modern social technicalization. Cultures of Science, 6(3), 313–321.

[13] Zhou, S. D. (2023). Digital revolution, change of production mode and adjustment of the relations of production in capitalism. Studies on Marxist Theory, 9(4), 36–47.

[14] Zhao, Z. L., & Zhang, J. Y. (2020). Data and capital: The new trend of capitalism and its critical analysis. Contemporary World and Socialism, (5), 103–111.

[15] Han, W. L., & Li, Y. C. (2024). The triple structures and evolutionary trends of AI capitalism. Contemporary World and Socialism, (3), 113–120.

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[16] Sun, W. P. (2021). Intelligent society: The foundation and condition of the construction of communist society. Studies on Marxism, (1), 48–56.

[17] Xu, W. (2020). Application analysis and future development of quantum secure communication technology. Information Technology and Informatization, (3), 92–94.

[18] Yan, R. F., Zhang, H., & Qiu, H. L. (2023). Three dimensional ethical governance considerations of gene editing technology: Problems, dilemmas and solutions. Studies in Dialectics of Nature, 39(3), 104–110.

[19] Homa, M., Pałac, A., Żołądek, M., & Figaj, R. (2022). Small-scale hybrid and polygeneration renewable energy systems: Energy generation and storage technologies, applications, and analysis methodology. Energies, 15(23), 9152.

[20] Lenzen, M. (2010). Current state of development of electricity-generating technologies: A literature review. Energies, 3(3), 462–591.

[21] Xu, W. Q., Chen, L., Sui, X. F., Tian, Y., & Liu, Z. Y. (2023). Brain-computer interface—Brain information reading and activity control. Chinese Science Bulletin, 68(8), 927–943.

[22] Zhou, Y. M. (2024). Risk expression and legal regulation logic of brain-computer interface technology embedding. Jianghan Tribune, (8), 125–129.

[23] Hong, Y. (2023). Future trend of supply chain being exposed to the metaverse. Highlights in Business, Economics and Management, 11, 149–154.

[24] Klöckner, M., Kurpjuweit, S., Velu, C., & Wagner, S. M. (2020). Does blockchain for 3D printing offer opportunities for business model innovation? Research-Technology Management, 63(4), 18–27.

[25] Wang, C. Y., Cao, M. H., & Cao, X. Q. Q. (2019). Development status, application and future prospects of quantum computing artificial intelligence. Strait Science, (9), 83–87.

[26] Sun, Q. Y., Liu, G. L., & Wang, Y. F. (2025). Review and prospect of energy terminal in energy internet. Power System Technology, 49(5), 1792–1805.

[27] Wang, Y. (2023). The effectiveness of brain-computer interface technology in the metaverse. Journal of Artificial Intelligence Practice, 6(7), 13–22.