

# The “Island Phenomenon” in Scientific and Technological Innovation and Its Governance Approach

Gao Xuedong, Wang Zhanyi & Zhang Zhongsheng\*

**Abstract:** General Secretary Xi Jinping has repeatedly stressed that we should eliminate the “island phenomenon” in technological innovation. The “island phenomenon” negatively affects the transfer and spread of technological achievements, resulting in inefficient technological innovation and transfer, and significantly impedes the implementation of innovation-driven development strategies. The emergence of the “island phenomenon” should be attributed to a failure to give full play to the “invisible hand” of the market and the overreach or absence of government’s “visible hand.” Local governments can play an important role in eliminating this phenomenon by leading and guiding efforts to enhance improvements in innovation technology and transfers.

**Keywords:** island phenomenon; information technology; institutional innovation; government-led

## 1. Highlighting the “island phenomenon”

Since the discussions regarding technological innovation during the 18th CPC National Congress, General Secretary Xi Jinping has reiterated the necessity of eliminating the “island phenomenon” in scientific innovation, clearing obstacles

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\* Gao Xuedong, professor, Shandong Academy of Governance.

Wang Zhanyi, professor, Party School of Yantai Municipal Party Committee.

Zhang Zhongsheng, professor, Information Technology Department, Shandong Academy of Governance.

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to the transfer and spread of technological achievements, and improving the overall efficiency of the national innovation system. The “island phenomenon” mainly refers to certain conditions that promote isolation from the integral scientific and technological innovation system, such as science and technology’s isolation from economic output and scientific and technological supply’s isolation from scientific and technological demand. During the process of scientific innovation, there is seldom an exchange of resources, information or staff between the various sectors resulting in a “closed loop” within the system and low efficiency in scientific and technological transfers and innovation.<sup>①</sup> The existence of the “island phenomenon” means the entire innovation system cannot be upgraded although the insufficient drive capability may be improved. Because the “island phenomenon” lowers the overall efficiency of the innovation system, studies on how to eliminate this situation are of practical significance for the further improvement of China’s innovation-driven development strategy and the transformation of new and traditional driving factors.

## 2. A review of previous studies on the “island phenomenon” in technological innovation

So far, not many essays on the “island phenomenon” in technological innovation have been published in foreign journals. Peter and Fusfeld (1983), as well as Geisleret (1991) explored the dilemma in university-industry research institute collaboration from a perspective of cooperative motivation. Worsetll, Jonatham (2001) and Ding (2001) discussed the need to overcome organizational snags to technology transfer to avoid the emergence of information islanding. Edward J. McCaffery (2005) applied the theory of “isolation effect” to the analysis of public policies concerning technological investments. However, there is a lack of studies focusing solely on the “island phenomenon.” Nevertheless, the “island phenomenon”-related analyses in economics and management can be adopted here for reference purposes.

In China, theoretical studies of the “island phenomenon” in technological innovation initially focused on “information islanding” and paid scant attention to the very essence of the “island phenomenon” in technological innovation. In recent years, particularly since General Secretary Xi Jinping called for the elimination of the “island phenomenon”, there has been a significant increase in relevant research with varied focuses, which are mainly reflected in the following three aspects.

Substantial research findings have been made in exploring the significance, manifestation, causes and hazards of the “island phenomenon” and eliminating this phenomenon in scientific and technological innovation. Based on investigations and analyses targeting institutional obstacles, Yan Jun explored and analyzed possible “island phenomenon” in technological innovation and the negative impacts such phenomena can exert on economic growth.<sup>②</sup> Zhang Yuanhua, et al. approached this topic from the effective combination of the innovation and industry chains to explore their significance in the relationship between science and technology and economic growth.<sup>③</sup> Zhu Chao discovered through his study that due to various factors including institutions, strengths, and history, the actual process of technological innovation may

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① Xin, 2017

② Yan, 2015

③ Zhang, Ling & Jiang, 2015

give rise to “environment islanding,” “management islanding,” “resource islanding,” and “information islanding,” and disconnected technological innovations from social and economic development, and technological innovation projects from market demands. He held that it was of great significance to strive to eliminate “island phenomenon” in the context of reform.<sup>①</sup>

Exploring feasible counter measures and approaches to eliminating the “island phenomenon” in technological innovation is a research focus for domestic scholars. Xie Xuemei, based on synergetics and Game Theory, analyzed the inner mechanisms of the “islanding effect” in urban technological innovation and also proposed corresponding counter measures.<sup>②</sup> Tu Nana completed a case study of Fujian Province with relevant theories of management and integrated management and proposed building a resource integration platform model for technological innovation, improving the comprehensive quality of platforms, shortening the psychological distance between platforms, improving the environment for resource integration, and introducing other measures to facilitate resource integrations.<sup>③</sup> Wang Cuixia analyzed possible harm that the “island phenomenon” could cause by exploring the main barriers to the development of China’s innovation system and policy incentives.<sup>④</sup> Xiao Lingji, Wang Mingyue and Wan Ling proposed to connect the “isolated island” through innovative knowledge transmission , awaken existing knowledge , etc.<sup>⑤</sup>

Overall, there has been an increasing number of studies on the “island phenomenon” in scientific and technological innovation over the past years. And substantial research findings have been made in exploring the significance, manifestations, causes and hazards of “island phenomenon,” and possible counter measures and approaches to the elimination of this phenomenon in technological innovation. This, to some extent, helps to lead, guide and promote the practice of eliminating the “island phenomenon” in technological innovation. However, there is still a lack of, or even an absence of, systematic studies on the roles of local governments in tackling the “island phenomenon” in scientific and technological innovation. In fact, local governments play an important role in scientific and technological innovation and have a great potential in eliminating the “island phenomenon.”<sup>⑥</sup> To this end, this paper attempts to focus on the role local governments can adopt in enhancing institutional innovations that have the potential to act as counter measures to the “island phenomenon” in scientific and technological innovation.

### 3. Local governments’ limits and efforts to eliminate the “island phenomenon” in scientific and technological innovation

#### 3.1 Local governments’ efforts to avoid and eliminate “island phenomenon” in scientific and technological innovation

To avoid the emergence of the “island phenomenon” in technological innovation, local governments

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① Zhu, 2015

② Xie, 2010

③ Tu, 2013

④ Wang, 2014

⑤ Xiao, Wang & Wan, 2015

⑥ Xin, 2017

should endeavor to adhere to the principle of economic growth-oriented technological development and market dominance, give full play to their role as leaders and guides, create a favorable regional policy environment conducive to avoiding or eliminating the “island phenomenon” in technological innovation, improve the overall performance of their regional innovation system, realize innovation-driven development, enable old-new energy conversion, and boost sustainable development in their regional economy and society.

#### 3.1.1 Taking the initiative to play a dominant role

Local governments should take the initiative to facilitate the integrated development of the industrial, innovative and capital chains.<sup>①</sup> Through rational institutional designs and arrangements, technological institutional reforms and organizational guarantee enhancements, they can promote three-dimensional diversified collaboration among innovators and integrated development of the three chains in an all-round way. Meanwhile, they can also take the initiative to advance supply-side structural reforms through technological innovation, create a universal institutional environment to boost technological innovations, provide precise and efficient public whole-chain services for technological innovations, make more efforts to accelerate the commercialization of technological achievements, enhance the implementation of relevant laws, regulations and policies on technology transfers and commercialization at the local level, and tackle the “last mile” policy challenges.

#### 3.1.2 Taking the initiative to play a guiding role

Given that market resource allocation features blindness and spontaneity, to avoid or eliminate the “island phenomenon” in scientific and technological innovation, local governments should introduce more policy incentives and a package of quality support policies on talent introduction, project cultivation, carrier construction, intellectual property creation, and technological financing to build an all-round policy system.<sup>②</sup> Aiming to enhance the effective alignment of the innovation and industry chains with market demands, governments should make full use of policy tools (procurement preferences, tax preferences, etc.) to enable the rational distribution of technological resources. Also, local governments should optimize capital channeling, ensure sufficient investments in technological innovation, protect efficient projects from “money shortages,” reduce expenditures in “idle projects” and improve the efficiency of innovation funding. In addition, they should enhance public opinion guidance, cultivate an innovation culture that “embraces success and tolerates failure,” advocate an adventurous spirit of “daring to pioneer” and guide public opinion towards support of scientific and technological innovation.

#### 3.1.3 Taking the initiative to play a supporting role

Local governments should strive to tackle the “internal obstructions” between entities (government authorities, enterprises, colleges & universities and scientific institutions) and intermediary agencies, strengthen cooperation and collaboration among innovators, and facilitate the free flow of talent, capital, technology and knowledge. Local governments should also establish and maintain a database of technological innovation talents, implement follow-up investigations of high-level talents, cultivate key staff to build a high-

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① Xin, 2017

② ibid

level team with top capacity in technological innovation and establish a benchmark for regional scientific and technological innovation.

### **3.2 Local governments' limits: a cause of the "island phenomenon" in scientific and technological innovation**

The emergence of the "island phenomenon" should be attributed to a failure to give full play to the "invisible hand" of market and either the overreach or absence of government's "visible hand." Local governments in this regard fail to give full play to their role as leaders and guides in eliminating the "island phenomenon" in scientific and technological innovation, which has become a pressing problem. Local governments' failure mainly results from the following five aspects.

#### **3.2.1 Overlapping institutions & functions and inefficient resource allocations**

At present, local governmental authorities involved in scientific and technological innovation include authorities and commissions of science & technology, development & reform, economy & information technology, education, agriculture, etc. Based on their own functions and demands, each governmental authority has corresponding institutions responsible for technological and industrial policies. Due to lack of clear-cut job responsibilities and divisions of labor, local governmental authorities formulate different policies for promoting the development of their high-tech industries, the cultivation of emerging strategic industries and the transformation and upgrading of enterprise technologies, and use different financial funds for setting similar technological projects resulting in redundant resource allocations and inability to form resultant of forces.

#### **3.2.2 Administrative fragmentation, divided policies from various sources and isolation of technologies and economies**

The existing technological management systems feature administrative fragmentation. Often divided policies are issued by different governmental authorities and therefore lack consistency and coordination. Take the accreditation of platforms for enterprise innovation as an example. Local development and reform commissions are responsible for the accreditation of enterprise engineering research centers; local commissions of economic and information technology are responsible for the accreditation of enterprise technology centers; local departments of science and technology are responsible for the accreditation of strategic alliances for industrial technology innovation; local departments of education are responsible for the accreditation of collaborative innovation centers; local departments of agriculture are responsible for the accreditation of strategic alliances for agricultural technology innovation, etc. Due to administrative segmentation, the formulation and execution of science and technology policy lacks effective coordination which directly results in the imbalanced and isolated development of technologies and economies.

#### **3.2.3 Excessive interference, limited means and poor public service**

Local governments authorities of science and technology still follow traditional "science and technology commission"-based approaches; rely excessively on commissioned scientific and technological projects; attach great importance to R&D investments in individual projects; intervene excessively in the specific operation of technological projects; input a huge amount of manpower, material and financial resources; intrude in the specific affairs of technological management; overlook the exploration and summarization of the huge demand for technological innovation triggered by economic and social development; and pay scant attention to the building of platforms for local public innovation services and the cultivation of technological talents.

All these malpractices contribute to unsatisfactory management and low management efficiency. Given that China's current intermediary services for technological innovation is divorced from the existing demands for technological innovation, local governments failed to play their due role in making up for the defects in intermediary services while at the same time giving rise to the emergence of information islanding.

#### 3.2.4 Rigid mechanisms and mismatch between technology and market demands

At present, local governments and relevant authorities support innovators mainly in the form of project approvals, funding, etc. Due to improper institutional arrangements and rigid mechanisms, project guidance is mainly done by an expert panel consisting of professors and experts from institutions of higher learning. It is true that governmental authorities have engaged some corporate personnel in this guidance but overall the guidance teams are still dominated by basic-level researchers from research institutions, colleges and universities. This explains why these project guides focus more on advancement and foresight than enterprise demands, resulting in a supply-demand imbalance. Too frequently applicable technologies urgently needed by relevant enterprises cannot obtain support due to their exclusion by the research guides while other high-profile projects which are not urgently needed can attract research funding, even though their poor applicability makes it impossible for them to generate real productivity.

#### 3.2.5 Improper employment mechanisms, poor coordination and severe human resources waste

Out of confidentiality considerations, talent flow in some special areas is usually not allowed. But the exchange of key researchers and leading talents at research institutes, colleges and universities should be encouraged to a reasonable extent. Current talent applications, however, still feature isolation and exclusiveness. To encourage talent applications local governments have taken a series of measures, such as policies allowing and encouraging talent flow, which are in conflict with the existing prohibition of public institution staff from taking any part-time job and are also contrary to the auditing policies implemented since the issuing of the "Eight-point Austerity Rules." Factors such as divided policies and poor policy coordination contribute to a substantial waste of talent resources.

## 4. Local governments' approach to the elimination of the "island phenomenon"

### 4.1 Reforming institutional mechanisms for technological innovation

#### 4.1.1 Establishing a regional comprehensive mechanism for promoting scientific and technological innovation

In response to the trend of integrating scientific and technological innovations with industry development and to the transformation of governmental administration functions and styles, local governments should duly establish comprehensive mechanisms for promoting scientific and technological innovation.

(1) Establishing a regional comprehensive mechanism for promoting scientific and technological innovation. By drawing on Shenzhen's experience, local governments should establish a municipal-level commission for technological innovations which would be the regional comprehensive competent authority for technological development in a bid to advance innovation-driven development strategies.

(2) Piloting co-located administrations between technological and economic authorities. Take Shandong Province as an example. It could draw on the development experience of Pudong, Shanghai to pilot a co-located administration with technological and economic authorities (i.e. the two authorities share the same



office). More specifically, Shandong could also establish technological and economic commissions to be their competent authorities for technological and industrial affairs and tackle the problems of “isolated development” of technology and economy from an institutional perspective while promoting in-depth integration between technological development with economic growth.

#### 4.1.2 Further streamlining administration and delegating power to the lower levels

Local technological management authorities should “work hard on strategies, plans, policies and services,” and further improve their services in advancing technological innovations.

(1) Creating a fair environment for market competition. Local governments should deepen the reform for technological innovations, which is characterized by streamlining administrations, combining power delegation-and-regulation, as well as service optimization. They should further list their streamlining items, improve the market access systems, perfect the industrial systems of technological policies and management, improve the IPR protection system, and create a fair environment for market competition in technological innovation.

(2) Optimizing the environment for collaborative innovation. Local governments should adhere to the principle of “no prior-interference,” “in-process guidance” and “post support;” further streamline administrations and delegate power to the lower levels; strive to clear the way for industry-university-research institute collaborations and provide corresponding quality services; and eliminate the vertical and horizontal restrictions of administrative management. Local governments should shift their focus from administrative reviews, approvals and resource allocations to risk control, planning guidance and service optimization and try all means to create a best possible external environments for industry-university-research institute collaborative innovations.

#### 4.1.3 Improving the public service system for innovation

As public service providers, local governments should target technological innovators to develop public service platforms for collaborative innovation to organically integrate the innovations in scientific technology, industry, management, business modes and finance.

(1) Building public service platforms. Scientific and technological innovation is a systematic project which involves innovation, industry, capital and policy chains. Local governments should strive to promote industry-university-research institute collaborative innovations by developing public service platforms for technological collaborative innovations, advancing resource sharing for technological innovations, adapting to the “Internet +” development trend, building a sound and complete information network for technological innovations, and creating innovators-oriented platforms for exchanging scientific and technological achievements.

(2) Highlighting the leading role of relevant projects. Local governments should be market-oriented, focusing on major science and technology demands for regional industrial development, conducting whole-chain scientific and technological innovation designs, give full play to enterprises’ leading role along the innovation chains, and enabling collaborative innovations in major scientific and technological projects and special projects.

#### 4.1.4 Reforming scientific and technological funding allocations

To better perform their public functions, local governments should include special funds in the scope of public finance to ensure and support industry-university-research institute collaborative innovations.

(1) Adjusting the direction of financial investments. Currently local governments tend to inject most of

their scientific and technological funds in the R&D and results transformation stages while being reluctant to invest in the pilot test stage. In fact, “institutions of higher learning have no funds for the pilot test stage, nor do they want to invest in it; while relevant enterprises are unwilling to take corresponding investment risks.” Considering such a reality, local governments should spend more scientific and technological funds on the pilot test stages and change their focus from lab-based research and development to attaching equal importance to scientific and technological research and development and processing.

(2) Improving the efficiency of scientific and technological funds. Given that the existing funds for scientific and technological innovation feature over-scattered allocations which result in low efficiency, local governments should give play to economic leverage and market regulations; center on major regional projects of technological innovation (particularly projects that can effectively encourage innovators to engage in collaborative innovations and that can effectively promote technological result transfers), and use limited funds to accomplish major projects in a planned way.

#### 4.1.5 Improving scientific and technological management systems

Local governments should rationally utilize management systems, enhance functions of macro-environmental construction (planning, policy formulation, mechanism operation, etc.), and shift the focus of technological management from specific project management to macro-environment management and improvement.

(1) Enhancing reform in key areas. Local governments should further improve the mechanisms for the collaborative management of scientific and technological innovation and safeguard the legitimate rights and interests of innovators. They should also reform and improve the management of R&D fund so that researchers do not have to worry much about “excessive-consumption” and can concentrate on scientific and technological research.

(2) Improving the systems and mechanisms for science and technology achievement evaluations. According to different types of scientific and technological innovators and the rules and characteristics of specific innovation activities, local governments should, under the guidance of a “three-dimensional” evaluation system, build and improve subject-specific systems for innovation evaluations to further rationalize the evaluations of collaborative innovations and stimulate the vitality of innovators.

### **4.2 Improving the policy mechanism for scientific and technological innovation**

Local governments should optimize services and guidance for new policies in a coordinated way and gather more innovation resources for innovators.

#### 4.2.1 Attaching more importance to policy guidance

Local governments should play a leading role in strategic planning, major policy formulations, and major project coordination to establish a supporting policy system for the sustainable development of industry-university-research institute collaborative innovations.

(1) Building an all-round policy guarantee system. Local governments should introduce a package of well-designed guiding policies concerning planning, talent introduction, project cultivation, carrier construction, IPR creation, enterprise financing, etc., and build and improve an all-round policy system conducive to scientific and technological innovations.

(2) Creating a policy chain for collaborative innovations. Local governments should enact a series of policies (including plans for emerging strategic industries and plans for future industries) to develop a policy



chain that covers the entire process of an independent innovation system in terms of financial support, talent pool, innovation carrier building, service development, etc. to ensure the sustainable development of industry-university-research institute collaborative innovations.

#### 4.2.2 Enhancing planning guidance

As the primary organizers and managers of scientific and technological innovations, local governments should formulate rational and scientific technological plans; combine industries, universities and research institutes to form a “community of common interests” for collaborative innovations; and guide the collaborative innovators for more targeted and effective R&D results.

(1) Planning for industry-university-research institute collaborative innovations in a scientific way. In order to effectively tackle the challenge of technological information asymmetry among innovators (enterprises, colleges & universities, research institutes) and the challenge of subordinating R&D achievements to real productivity, local governments should strive to formulate rational middle and long-term development plans for industry-university-research institute collaborative innovations according to local technological needs so that relevant researches can better satisfy local industries’ needs for technological innovations.

#### (2) Enhancing the management of industry-university-research institute collaboration

Local governments should give full play to their leading roles in overall planning and coordination to effectively integrate innovation resources from different divisions in different areas; and attach more importance to industry-university-research institute collaborative projects with significant impact on the development of corresponding industries to enable information exchange, resource sharing, as well as new resources for technology innovations in a rapid and effective way.

#### 4.2.3 Strengthening guidance on financial funding

Financial funds for scientific and technological innovations are limited. Local governments should work harder on guiding the allocation and application of funds and encourage and stimulate more social capital into industry-university-research institute collaborative innovations.

(1) Forging a complete capital chain for industry-university-research institute collaborative innovations. Local governments should make full use of a diversity of funding modes (direct investments, tax preferences, etc.) to enhance their capacity for technological resource allocations (capital input in particular), and develop a sound and complete capital chain covering the whole process of industry-university-research institute collaboration.

(2) Developing a multi-mechanism for scientific and technological investments and financing. Local governments should promote diverse investing mechanism featuring “fiscal input-led, enterprise investment-dominant and financial capital & private capital-followed” by supporting and participating in building venture capital mechanisms and promoting market financing.

### 4.3 Establishing a mechanism for sharing scientific and technological innovation factors

#### 4.3.1 Advancing resource sharing

Each region has its own substantial reserve of scientific instruments and equipment. Local governments should strive to break the boundaries between innovators (i.e. universities, research institutes & enterprises) to take better advantage of their abundant scientific instruments and equipment and facilitate efficient sharing of scientific and technological innovation resources.

(1) Building a unified and open platform for scientific and technological resource gathering and

distribution. Local governments should build a regional unified network known as the “Center for industry-university-research institute collaboration” and open the technological information network to the public via an innovation resource sharing platform. They should also build a mechanism for resource sharing via the platform, update information on resource utilization in real time, and increase the utilization rates of innovation resources.

#### (2) Developing a system for opening scientific and technological R&D resources

Local governments should build a management system for scientific and technological innovation resources by drawing on the experience of Beijing’s establishment of the “Beijing collaborative fund for scientific instruments and equipment,” open the labs, large instruments and equipment of universities and research institutes to the public in an orderly way, and activate idle R&D resources.

#### 4.3.2 Facilitating information sharing

Local governments should play a leading role in building an information service system for industry-university-research institute collaborative innovation.

(1) Reinforcing infrastructure construction. Local governments should create databases of innovation information. They should encourage and support intermediary agencies to build a technological information system; expand and strengthen their technological information networks through social force or market power; boost information and service exchanges among enterprises, colleges & universities and research institutes; and gradually expand the base of the targeted audience and the influence of the data platform.

(2) Building an information network platform for collaborative innovation. Local governments should establish an information network platform for collaborative innovations with high-tech information network technology. With the help of the information network platform, universities and research institutes can fully showcase and promote their R&D achievements, grasp market and enterprise needs; while enterprises, being innovators, can learn more about universities and research institutes’ R&D strengths and application prospects of existing innovations.

#### 4.3.3 Improving the talent mechanisms

Talents form a prerequisite for technological innovation. Local governments should strive to clear the way for talent cultivation and introductions.

(1) Improving talent policy systems and working mechanisms. Local governments should transform their talent policies from a “management-dominated” model to a “service-first” model and delegate more HR autonomy to major technological innovators, namely, enterprises, colleges and universities and research institutes. They should develop a talent evaluation system guided by the principle of “scientific technology-generated quality, contributions and performance” and stimulate talents’ vitality.

(2) Building a mechanism for two-way flow and sharing of talents. Local governments should develop a flexible employment system; break the boundaries among colleges and universities, research institutes and enterprises; build a platform for talent exchange; allow and encourage researchers and technical personnel to communicate; and give full play to their intelligence and wisdom.

## REFERENCES

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- Tu Nana. (2013). *Study on the resource integration of technological innovation platform of Fujian Province*. (PhD dissertation). Fuzhou University.
- Wang Cuixia. (2014). *A study on Industry-University collaborative innovation mechanism of the national system of innovation*. (PhD dissertation). Zhejiang University.
- Xiao Lingji, Wang Mingyue & Wan Ling. (2015). The research of innovation development path of the emerging industry in the new normality. *Science & Technology Progress and Policy*, 22.
- Xie Xuemei. (2010). Study on inherent mechanism of "islanding effect" for synergy of technology innovation among cities in metropolitan area. *Science of Science and Management of S. & T.*, 10.
- Xin Xianjie. (2017, March 27). How to tackle the challenge of innovation islanding. *People's Daily*.
- Yan Jun. (2015). Why did General Secretary Xi mention the "island phenomenon"—an exploration of major institutional barriers in scientific and technological innovation? *National Governance Weekly*, 11.
- Zhang Yuanhua; Ling Dongxing & Jiang Xiucong. (2015). The development of industry chain-revolved innovation chain to boost the tight integration of scientific technology with economy. *Science & Technology in China*, 19.
- Zhu Chao. (2015). *An exploration of a proper approach to the elimination of "Island phenomenon" in technological innovation against the backdrop of reform-deepening*. (PhD dissertation). Wuhan Institute of Technology.

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