

An Exploration into Green-Tech Innovations Based on “Four Modernizations”

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Abstract

The world today is facing a new round of scientific, technological and industrial revolution, and all countries are seeking new development models that have a major role in driving and leading the economy and society. China is also addressing the imbalance between economic development and ecological environmental protection through innovation development of green technology and continuously strives for high-quality economic development. Exploring the integrated development mode of green technology innovation has great theoretical significance and practical value for enhancing the competitiveness of enterprises, promoting the transformation and transfer of green technologies, spurring the development of green “One Belt and One Road”, and driving the economic development and reform in quality, efficiency, and forces. This article sorts out the core elements and influencing factors of constructing a green technology innovation and integration development model, expounds the innovation ecological framework that supports the development of green industries from the four dimensions of industrialization, marketization, informatization, and internationalization, and builds an intermediary that promotes integrated development. The functional architecture proposes an informatization infrastructure that promotes the industrial ecology, and designs a model for the integration and development of international green technology innovation, is of momentous theoretical significance and practical value to improve the quality of the global green development.

Keywords

Internationalization, Green Technology, Technology Innovation, Integrative Development, Development Mode

1. Prelude

Today's world is facing a comprehensive transformation brought about by technological changes. The improvement of production tools has led to an increase in productivity and the promotion of the overall adjustment of production relations. It's inevitable that new challenges are facing the traditional development model. Countries in the world are exploring new models to meet the needs of new production relations. China is finding solutions to the imbalance between economic development and ecological environmental protection through accelerating the transformation of its economic development mode and innovating green technology, so as to advance the realization of high-quality economic development.

Green technology innovation is a complex process involving multi-subjects' collaborative participation and promoting the harmonious development of man and nature. Development driven by green technology innovation will surely promote technological cluster breakthroughs in multiple fields such as information technology, biology, new energy, and new materials, will surely provide new support and power for future social and economic development, will surely promote the development and upgrading of a series of related industries, like energy conservation, environmental protection, clean production, and clean energy, and enhance the development momentum of circular economy and low-carbon economy. Also, strengthening green technological innovation will surely stimulate the vitality of various innovation entities and provide a broader space for the cooperation and development of ecological civilization construction in countries along the "One Belt and One Road", which will not only bring new development opportunities for China, but also for global sustainable development.

2. Problems Hassling Green-Tech Innovations & Reasons behind

2.1. Problems Hassling Green-Tech Innovations

The current process of technological innovation and development has shown a trend of "multi-dimensional driving and integrated development". China is exploring the ways to precisely match the "research genes" of scientific research institutions with the upstream and downstream "market genes" of the green industry in certain areas; the platform to collaborative innovate the five chains, including "industrial, innovation, talent, capital, and policy"; and the shared and integrated service models of intellectual property rights, transaction intermediaries, and financial investment in terms of achievement transformation and transfer services. In 2018, 3200 colleges and institutes signed technology transfer (including transfer, licensing, and equity purchase), technology development, technology consulting, and technical services ("four technologies") contracts totaling 93.08 billion yuan, a year-on-year increase of 16.6%. In 2018, the total number of R & D institutions, transfer institutions, and transformation service

platforms jointly established with enterprises was 8247, a year-on-year increase of 14.8%. 2155 new companies are created and participated, a year-on-year increase of 16.2%¹. As of October 30, 2020, the number of Growth Enterprise Markets (GEM) listed companies has reached 871, accounting for 21.42% of the total number of A-share listed companies, with a total market value of 10.40 trillion yuan². These explorations have produced some results in some aspects, but in the face of the demand for green-tech innovation and development, there are still many problems such as the disconnection of supply and demand and the absence of services caused by lack of trust mechanism, information resources, capital investment, and professional services [1].

2.2. Reasons behind

The problems can basically be attributed to these two main factors of collaboration and trust among multiple entities in the process of green technology innovation. For collaboration, it refers to the coordination system mechanism of resource information symmetry, complementary resource advantages, and resource efficiency sharing among the entities; for trust, it refers to the trust guarantee mechanism involved in fairness of transactions, the security of funds, the security of funds, etc. If lacking of collaboration system mechanism among the main bodies, on the one hand, the coexistence of resource dispersion, force scattering, resource waste and difficulty in improving efficiency, resulting in the difficulty in improving the overall efficiency of green technology innovation. On the other hand, the coexistence of idle resources and difficulty in realizing innovation due to lack of resources, leading to the difficulty in the comprehensive construction of green technology innovation ecosystem. If the main body of green technology innovation lacks trust guarantee mechanism, a large number of scientific and technological achievements can only be put on the shelf; the development of a large number of green industries will be difficult to find the support of scientific and technological achievements, they can only be a drop in the bucket; a large amount of capital is also difficult to find credible investment projects and reliable investment channels. Therefore, green technology innovation must establish a coordination system mechanism and a trust guarantee mechanism, in order to fully connect the motivation and energy between various subjects and enhance the power and vitality of green technology innovation.

3. Development Framework for Green-Tech Innovations

3.1. Comprehensive Service Platform to Build

In addition to coordination and trust assurance, green-tech innovation needs government supportive and empowering policies. It also needs specialized service agencies to connect and coordinate green-tech innovative institutions, and

¹“China’s Scientific and Technologies Transformation 2019 Annual Report (Universities and Research Institutes)” published on May 13, 2020.

²<https://finance.sina.com.cn/roll/2020-11-02/doc-iiiznctkc8954427.shtml>

to put together any needed resources (especially financing and manufacturing resources), all for the commercialization of green-tech innovations and findings [2]. That is to say, green-tech innovation needs a platform that provides for crucial resources as industries, universities, research, government support, finances, agencies (to be called: 6 major resources). And this platform could implement coordination and trust assurance, and hinge on government policies and specialized agencies. Currently, One Belt and One Road Environmental Technology Exchange and Transfer Center (Shenzhen), a national platform jointly established by the Ministry of Ecology and Environment and the Shenzhen Municipal Government, explores innovative environmental technology exchange and transfer models, and promotes Shenzhen to become China's environmental protection "Silicon Valley" and international cooperation "highland". Experiences and models of the integration and development of green technologies, which have been learned during this practice, will have a positive reference for breaking the barriers of green technology conversion and building a green industry development service system.

3.2. Three Particular Developments to Make

Firstly, big data platform construction. Innovatively build two architectures (data technology architecture covering all data elements, application functional architecture that meets full application functions) and one mode (building an intelligent mode for platform operation and maintenance). Linking the data network of "people, finances, facilities, and affairs" to expand into a core data resource system covering all aspects of the core data elements of the green industry development ecology, connecting all parties of the "industry, university, research, government, investor and agency" to gather basic data information.

Secondly, physical and virtual facilities planning and construction. Green-tech innovations should be conveyed by physical premise, carrying the functions of exhibiting, showcasing, piloting and modeling. The premise should entail 4 functional facilities as industrial innovation support unit, green-tech R & D unit, international cooperation unit, public services unit for the purpose of business incubation. Meanwhile, with help of VR and internet technologies, we should initiate an international green industry alliance of "going out" and "bringing in" for green-tech innovations, creating an online-to-offline interacting environment which comprises "innovations, exhibitions, operations, corporate headquarters", all to achieve the concentration of green technologies, green-tech human capitals, green-tech financing and green-tech industries.

Thirdly, the construction of comprehensive service system. On the basis of big data platform and physical facilities, with integrating innovative financial services such as intellectual property equity investments and intellectual property securitization, a joint and collaborative operation service system to the comprehensive services is built to provide all parties of the "industry, university, research, government, investor and agency" with consultancy ("advisory + match-ups + de-

cision-making analysis”), finances (“incubation + human resource management + investing/fund-raising”), specialized service (“certifying + application-making + commercialization”). This is all to bring together needed resources(industrial resources, innovation facilities, human resources, capitals, government policies) to promote green-tech innovations, green developments and green lifestyle.

4. Four Dimensions for the Developments of Green-Tech Innovations

The green technology innovation model of big data platform, virtual and physical integration space, and comprehensive service system could make specialized innovation-supportive services all through the online-to-offline channels, make all parties of the “industry, university, research, government, investor and agency” through physical and virtual facilities, producing an interactive, reciprocal environment system for green-tech innovations. The system could further make green-tech innovations grow and combine in the four dimensions of industrialization, marketization, internationalization and informatization:

4.1. Industrial Dimension

The ecological integration system will form the soil for cultivating the development of green technology innovation, bringing together the industry needs, technologies, R & D resources, capitals from all parties of the “industry, university, research, government, investor and agency”, and promote R & D collaboration, market transactions, intellectual property operations, and financial support, Financial guarantee, standard construction, talent service, technology evaluation and promotion, etc., nurtures related services (notably technology transfer and commercialization service), matches up demand side with technologies, R & D capacities and funds, devoting technology innovations into green industry with less obstacles.

4.2. Market Dimension

Through the big data platform, the information of all parties of the “industry, university, research, government, investor and agency”, is integrated, so that all parties’ innovation elements are integrated and interoperable, and the ecological environment regulation is transformed into market incentive rules, guiding green technology innovation to be demand-oriented, and allowing the market to guide green technology developments in R & D directions, tactics, element pricing with clear objectives, full functionality, complete elements, and effective operation. It does not only promote green technology exchanges and transactions, cultivates a good green technology market environment, stimulates the vitality of the green technology innovation market, enhance the development strength of green industries, but also resolve the disconnection and obstruction bottleneck caused by transformation channels, insufficient trust, and incomplete services, inject energy into green technological innovation, and promote the in-depth de-

velopment of green technological innovation to marketization [3].

4.3. International Dimension

It utilizes online and offline channels, physical and virtual facilities, to break possible barriers to greatly extend the communication chain and broaden the scope of communication. It can realize the cooperation, co-construction, intercommunication and sharing with well-known relevant institutions at local and abroad, and cooperate with the parties of “industry-university-research-government-funding” in different time and space, It collaborates with local and international institutions, shares with all parties of the “industry, university, research, government, investor and agency” from different sides, consolidating domestic and international partnership, promotes multilateral cooperation, takes part in standards making, undertakes events(summits, forums, exhibitions, etc.), helps promote green technology to “go out” and “bring in” in the whole process of green development, and effectively promote the internationalization of green technology innovation development.

4.4. IT Dimension

It allows for a series of IT applications(data collection, data storage, data analysis, co-working, environment configuring, system security, system management, etc.) while delivering its services(R & D, R & D findings transfer, testing & certifying, incubation, IP services, consulting, financing, promotion, innovative activities, etc.), thus developing its green-tech IT capacities (data governance, data standards, data modeling, data applications, applied function extensions & maintenance, etc.), and largely improving its abilities in data cluster, data governing, data connecting, etc. These could provide a greatly conducive data service support, facilitate sharing and management of innovative factors, strengthen mutual trust among all sides of all parties of the “industry, university, research, government, investor and agency” by means of block chain logic and technologies, finally promoting the full-speed informatization development of green technology innovation.

5. Conclusion

At present, there are a lot of researches on green technology innovation, most of which are based on incomplete information. There are not many systematic studies that combine the resources of “industry, university, research, government, investor and agency” with information technology. The integration of information technology with resources from “industry, university, research, government, investor and agency”, which is proposed in this article, builds two spaces of “physical” and “virtual”, establishes a comprehensive service operation system for specialized technological innovation, and promotes the integrated development model of industrialization, marketization, internationalization and informatization of green technological innovation, which is an exploration in the de-

velopment of green technological innovation in a new environment.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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