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BUILDING AND MANAGING GREEN INNOVATION ECOSYSTEMS: ENVIRONMENTAL SUSTAINABILITY AND FIRM GROWTH

As global environmental problems become increasingly serious, green innovation has become a key way to promote sustainable development. In the face of increasingly pressing environmental problems such as climate change, resource depletion and ecological damage, enterprises inevitably face enormous pressure and moral responsibility for environmental protection while pursuing economic benefits. Therefore, building an effective green innovation ecosystem has become particularly important. Such a system can not only help companies achieve their environmental protection goals and reduce the environmental footprint of their operations, but also enhance their market competitiveness and long-term viability by introducing and promoting advanced environmental technologies and practices.

The green innovation ecosystem covers the full spectrum from product design and manufacturing to supply chain management and consumer interaction [1]. Through green innovation, companies can develop new sustainable products and services, improve production processes to reduce the use of energy and raw materials, and thereby reduce waste and emissions while improving resource efficiency. In addition, through collaboration with governments, research institutions, NGOs and consumers, businesses can not only promote the advancement of environmental technologies, but also shape the green consumption habits of consumers, further expanding the social and environmental benefits of their green innovations.

In this way, green innovation ecosystems are not just a tool for solving environmental problems, but also a driver of strategic transformation and future growth. Globally, more and more companies and markets have begun to recognize that sustainability is not only a necessity for modern business, but also a key factor for future business success. Therefore, companies need to continuously explore and implement green innovation strategies to ensure that they remain competitive in a rapidly changing market environment.

Green innovation is defined as the introduction and implementation of new products, processes or practices that significantly reduce or eliminate negative environmental impacts. This encompasses three main types: product innovation, which involves the development of new or significantly improved goods or services that have a low environmental impact over their life cycle; process innovation, which includes new or significantly improved methods of production or delivery characterized by major changes in technology, equipment and/or software; and organizational innovation, which focuses on new business practices, workplace organization, or external relationships designed to improve environmental performance of external relationships.

Green technologies are key to sustainable development, providing solutions that protect the environment while increasing efficiency [2]. Areas of focus include renewable energy technologies that replace traditional fossil fuels, such as solar, wind, geothermal and bioenergy; energy efficiency, which reduces energy consumption as advances are made in building materials, industrial processes and transport; and waste management, featuring technologies that promote recycling and minimize waste generation, such as advanced composting and bioremediation.

Ecosystem theory in green innovation provides a valuable framework for understanding the dynamic, interconnected nature of these initiatives. The key components of an innovation ecosys-

tem include participants (firms, government agencies, research institutions, non-governmental organizations (NGOs) involved in the innovation process), resources (tangible and intangible assets required for innovation, such as finance, expertise, and information), activities (actions taken to generate innovation, dissemination and application of knowledge) and relationships (interactions between participants that facilitate the flow of knowledge and resources). Applying this theory emphasizes the importance of collaborative interactions and a supportive policy environment in nurturing and sustaining innovation, ensuring that green innovation effectively contributes to the goals of sustainable development while providing economic opportunities for the firms involved.

Building and managing successful green innovation ecosystems relies heavily on the active participation and collaboration of various stakeholders, each of whom plays a vital role in promoting and sustaining innovation. Governments create an enabling policy environment through incentives, regulations and direct support to promote green practices and can act as a catalyst by providing the necessary infrastructure or R&D funding. Businesses drive technological innovation and sustainable practices in their operations and supply chains, investing in new green technologies and often bringing these innovations to market. Research organizations provide the necessary foundational knowledge and technological breakthroughs, working with industry to refine and adapt technologies to meet business and environmental needs. Consumers influence businesses by choosing sustainable products and services, driving demand, and pushing businesses to innovate with green technologies. Non-governmental organizations (NGOs) promote environmental awareness and sustainable practices, often bridging the gap between communities, industries and governments.

In order to effectively manage the green innovation ecosystem, a variety of strategies and practices can be adopted to enhance collaboration and efficiency. Innovation-driven strategies encourage the development of new products and processes that contribute to environmental sustainability, foster a culture of innovation within organizations, and support start-ups and SMEs in developing green solutions. Sustainable supply chain management integrates environmental considerations into operations by sourcing materials sustainably, optimizing logistics to reduce carbon footprints, and implementing circular economy principles to minimize waste [3]. Knowledge sharing and technology transfer are critical to spreading green innovations across industries and borders through platforms for sharing best practices, workshops, and formal technology transfer agreements. Regular stakeholder engagement aligns goals and ensures commitment to the SDGs through collaborative projects, public-private partnerships and forums. Regulatory compliance serves as a benchmark, and leading companies strive to exceed these standards to gain a competitive advantage and set industry benchmarks. These strategies emphasize a multifaceted approach, highlighting the interconnectedness and interdependence of different actors and actions. By integrating these strategies, businesses and Governments can create strong frameworks that support sustainable development and promote economic growth through green innovation.

In order to achieve the dual goals of environmental sustainability and enterprise growth, enterprises can adopt a variety of strategies. In terms of sustainable supply chain management, enterprises need to optimize the design of their supply chains, adopt environmentally friendly materials and technologies, reduce waste generation and energy consumption, and work with suppliers to ensure compliance with environmental standards and enhance the environmental friendliness of their supply chains [4]. In terms of product life cycle management, designing products that are recyclable or degradable and extending their lifespan is key, as well as implementing product recycling and remanufacturing processes to improve resource efficiency and reduce resource waste. In addition, improving energy efficiency in the production process, reducing energy consumption and carbon emissions, as well as investing in renewable energy projects such as solar and wind power, can reduce dependence on fossil fuels.

In terms of green innovation and technology development, sustained investment in R&D and innovation in environmental technologies can help enhance the market competitiveness of enter-

prises, which is not limited to product innovation, but also includes improving production processes and services. Corporate Social Responsibility (CSR) and Environmental Social Governance (ESG) practices are also key, and companies should strengthen their focus on the environmental and social impacts of their activities and implement ESG standards to enhance business sustainability through transparent reporting and accountability mechanisms.

Interface Inc. and Patagonia, for example, have not only achieved their environmental goals, but also driven sustainable business growth by integrating environmental protection into their core business strategies. Interface, through its Mission Zero programme, has implemented a strong environmental strategy, using sustainable materials and significantly reducing its environmental impact, thereby increasing brand value and competitiveness in the marketplace. Patagonia has strengthened its sustainable brand position in the marketplace and attracted a large number of loyal customers by using organic cotton and recycled materials and encouraging consumers to repair old products instead of buying new ones. These examples show that corporate environmental responsibility and business success can go hand in hand, with the key being innovation and long-term commitment, as well as the ability to adapt to rapidly changing consumer demands and environmental standards.

This paper discusses in depth the construction and management of green innovation ecosystems, emphasizing that while pursuing economic benefits, enterprises need to actively take responsibility for environmental protection. The study points out that building a green ecosystem not only helps enterprises achieve environmental sustainability, but also promotes long-term growth and market competitiveness through continuous green technology and product innovation. Specifically, enterprises can adopt the latest environmental technologies and methods to improve their production processes, thereby reducing waste generation and energy consumption and effectively minimizing negative impacts on the environment.

It also details how green innovation can be promoted through government policy support and incentives. For example, the government can provide tax incentives, financial subsidies or R&D support to help companies transition to greener production technologies and methods. In addition, enhanced co-operation between industry, academia and policy makers is called for to jointly promote the building of a healthy ecosystem that meets immediate economic needs while taking into account long-term ecological needs.

With this dual objective, companies can not only remain competitive in the marketplace, but also make significant contributions to global environmental sustainability. The case study demonstrates how a company, by integrating green strategies into its core business model, not only enhances its environmental responsibility, but also strengthens its overall brand value and customer loyalty. This model proves that environmental protection and economic growth can go hand in hand, providing new perspectives and practical solutions for global sustainable development.

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