Research on Green Manufacturing Innovation Based on Resource Environment Protection

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Abstract. Green manufacturing is a trend of manufacturing industry in the future, and is of great significance to resource protection and environmental protection. This paper first studies the green manufacturing innovation system, and then decomposes the green manufacturing innovation dimensions, and constructs the green manufacturing innovation dimension space. Finally, from the view of resource protection and environmental protection, this paper explores the path of green manufacturing innovation.

1. Introduction
Green manufacturing is a new trend for the future development of manufacturing industry. It advocates efficient, clean, low-carbon, recycling, and takes the road of ecological civilization. It can solve the problems that exist in the manufacturing industry at present. For example, the structure is not reasonable, the resources and environment problems are getting worse, the mode of production is extensive, and the ability of independent innovation is weak. Green manufacturing is the mainstream of national development strategy and development policy, and it is a new trend and inevitable choice for the development of manufacturing industry.

Green manufacturing innovation is an effective way to protect resources and environment, and is a new engine to realize the leaping development of economy. The traditional manufacturing industry has not yet got rid of the high input, high consumption and high emission development mode, and consumes a great amount of resources and energy. In the context of industrial economic development, traditional manufacturing has gradually declined with technological upgrading, no longer has a competitive advantage, and the resulting ecological environment problems are becoming increasingly serious. Therefore, it is urgent to speed up the transformation of the manufacturing industry from resource consumption manufacturing to green manufacturing, and realize great leap forward development.

2. Green manufacturing innovation system based on resource environment protection
The upgrading of manufacturing industry to green manufacturing needs to be based on the total factors innovation, in order to achieve the green transformation of traditional manufacturing and the green development of new manufacturing.

Innovation system is a system which promotes economic development by combining several elements of interaction and interdependence. It is the key to realize green manufacturing.

According to the factors, the green manufacturing innovation system based on resource environment protection can be divided into two categories: the green transformation of traditional manufacturing industry and the green development of new manufacturing industry. The factors of green transformation in traditional manufacturing industry refer to single factors, such as labor, capital,
natural resources, etc. The factors of green development of new manufacturing industry mainly refers to total factors: technology innovation, "Internet +", structural reform, etc. As shown in Figure 1.

![Figure 1](image1.png)

**Figure 1.** Green manufacturing innovation system based on resource environment protection

3. **Innovation dimensions of green manufacturing based on resource environment protection**

   According to the previous research, the green transformation of traditional manufacturing industry mainly depends on three dimensions: labor, capital and natural resources. As shown in Figure 2.

   The development of new green manufacturing industry depends mainly on three dimensions: technology innovation, "Internet +", structural reform. As shown in Figure 3.

![Figure 2](image2.png)

**Figure 2.** Dimensions of green transformation in traditional manufacturing industry

![Figure 3](image3.png)

**Figure 3.** Dimensions of green development in new manufacturing industry

   As can be seen from Figures 2 and Figures 3, these three innovative dimensions form a three-dimensional space, XYZ. In different values, these three innovative dimensions form different forces, and ultimately promote green manufacturing innovation in many ways.

4. **Innovation path of green manufacturing based on resource environment protection**

   As the three innovation dimensions interact with each other in different ways, fields and sizes, as well as the complexity and incomplete controllability of the influencing factors, green manufacturing innovation will be promoted in different ways. As shown in Figure 4.
4.1. Reforming traditional manufacturing industry, developing energy saving and environmental protection industry

The traditional manufacturing reform needs to reduce energy consumption and improve efficiency. For example, encourage the use of low-carbon energy, improve the efficiency of resource utilization, and eliminate backward equipment technology. The development of new manufacturing industry needs to improve the R & D capability of green technology. For example, leading the green development of the emerging manufacturing industry, accelerate the development of green products, and vigorously develop energy-saving environmental protection manufacturing industry.

4.2. Enhance scientific and technological support ability, promoting green innovation and development

Science and technology support ability promotion needs to follow the technological revolution and the direction of industrial change, accelerating the innovation of green science and technology. For example, increase key generic technology research and development efforts, increase the effective supply of green scientific and technological achievements, accelerating the development of key technologies for the greening of traditional industries, support green manufacturing core technology research and development, encourage the common technology research and development of green manufacturing.

4.3. Promoting the “Internet +” green manufacturing, enhance the level of Green Manufacturing Intelligence

The intelligent ability enhancement of green manufacturing needs to promote the integration of the Internet and green manufacturing. For example, raise the level of resources and environment management, promote the sharing of production factors and resources, using shared economic model to tap potential and promote green manufacturing and digital upgrading, promote the wisdom of energy management, using "Internet +" to promote green transformation of production methods, and promote green and lean production methods.

4.4. Giving full play to the guiding role of policies and institutions, promoting market regulation

The development of market regulation ability needs to optimize the industrial structure and regional layout, construction of long-term mechanism for green manufacturing. For example, deepening the reform of resource system, establish resource price formation mechanism, implement fiscal and taxation support policies, develop green credit, green bond and green fund, and strengthen the concept of green development.
5. Summary
The main contents of this paper are as follows.

Study the composition of green manufacturing innovation system. Scholars at home and abroad have not yet formed a unified definition of traditional manufacturing and new manufacturing industry, especially new manufacturing industry. This paper defines the connotation of the innovation system and analyzes the composition of the green manufacturing innovation system.

Deconstruct the elements and dimensions of green manufacturing innovation. The existing theories and practices seldom involve manufacturing upgrading and green manufacturing innovation. From the point of view of economics and management, this paper analyzes several elements of green manufacturing innovation, and extracts three dimensions of green manufacturing innovation.

Explore the path of green manufacturing innovation. On the basis of the spatial dimension of green manufacturing innovation, this paper explores the path of green manufacturing innovation by taking advantage of the resultant forces of three innovation dimensions.

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