

## Green Innovation: A New Paradigm

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### (Abstract)

*The importance of green innovation is increasing because of the growing concern of different industries towards the conservation of natural resources and the preservation of environment. From the past many years environmental concerns have been mostly addressed through sustainable development. Although this approach is helpful, it doesn't specify exactly the ways in which industries can achieve sustainability. In order to get a comparatively clearer picture, need of the hour is to understand the green innovation practices from successful companies those have already excelled in terms of being sustainable. This will provide strategies that can act as reference for companies that are new to exploring green innovation. In the light of such understanding, this paper attempts to explain the concept, theoretical framework, importance of "Green Innovation" and explains how this concept can be implemented.*

**Keywords:** *Green innovations; environmental innovations; innovation management; eco innovations; sustainability.*

### Introduction

With the increasing economic development, environmental problems have become more and more prominent. Environmental issues, such as global warming, ozone depletion, pollution etc. have greatly affected the economic development and progress for the coming generations. Increasing world population and consumption of resources by industries, such as coal, natural gas, oil etc. is leading to a gradual decrease and even depletion of these resources. Companies that do not respond to this environmental sensitivity will eventually lose their potential opportunities in the market. Owing to the fact that being environmentally responsible is the need of the hour and thus companies have started to change their attitudes and pay more attention to the consequences of their decision-making and management practices on the environment thereby promoting "eco-innovation". Some companies focus on designing green products, some focus on green production processes, some on raw materials and others on clean energy.

Noticeably, majority of the firms are still exploring green innovation practices. According to studies, green innovation introduces the idea of ecological importance into the development process so that environment is not harmed. In addition to this, organizations incorporating green innovation have the ability to respond to customer needs promptly and accurately thereby gaining competitive advantage.

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Green Innovation is referred to as the innovation that comprise of new or improved processes, practices, systems and products that benefit the environment and contribute to environmental sustainability. Green innovation consists of green product innovation and green process innovation. Green product innovation is the innovation of a new product or a service that causes no or less negative impact on the environment. Green process innovation is the modification or improvement of the existing production process by using technologies that are eco-friendly for the production of goods and services. To define the term “Green Innovation”, Driessen and Hillebrand (2002:344) use a pragmatic definition, stating that, “Green Innovation does not need to be developed with the objective of reducing the environmental burden, rather to yield considerable environmental benefits”.

Chen, Lai et al. (2006: 534) define green innovation as, “Innovation in hardware or software that involves green products or processes, including innovation in technology related to energy-saving, waste recycling, design of green product, pollution-prevention, or corporate environmental management”. Green innovation incorporates all those innovations that help in creating all those products, services, or processes so that harmful impact on the environment is reduced, and in addition to this optimizes the use of natural resources. Such kind of innovation plays a critical role nowadays because it channelizes the use of natural resources to improve overall human well-being. Moreover, the creation and integration of changes in products and the processes of production could lead to sustainable development.

Green innovation can result in reducing the inefficiencies and supporting judicious use of natural resources, which can play a major role in cost cutting. However, due to varied nature of different industries and firms itself, such as business form, resource situation etc. it is difficult to implement any research conclusion to create any reference model for green innovation, especially for emerging companies. Therefore, it is essential to understand green innovation practices of established firms to get a reference model. The firms which are in the initial stages of exploring green innovation can obtain useful expertise for efficient resource utilization. Green innovation is a strategic issue for the firms that aim at achieving environment upliftment as well as profitability and also actively responding to growing environmental requirements and demands. Conventionally, investing in eco-friendly patterns was considered as the most unnecessary step. But, present strict environmental regulations in combination with current conservationism trends have changed firm’s competitive strategies and corporate policies and patterns (Porter and Linde 1995). Presently, the word “Green” acts a stimulus for developing consistent innovation, which can lead to the identification of new market opportunities and building of loyal customer base (Leal-Millán et al. 2016).

## **Literature Review**

The available literature that refers to Green Innovation comprises of various terms such as, eco-innovation, environmental innovation, eco-technologies, green technologies etc. are used interchangeably as it denotes the same topic. During the last decade the definitions of eco-innovations evolved from being more generic description such as one given by Walley and Whitehead (1994, p. 81) as, “Being green is a catalyst for on going innovation, new market opportunities, and wealth creation”, and Porter and van der Linde (1995, p. 121), as “Green innovation can enhance corporate image and make companies more successful.” These authors stressed the importance of green innovation but couldn’t offer a clear and accurate description of the topic.

A number of definitions exist for the topic green innovation, and the first one is given by Fussler and James who define Eco-Innovations as “New products and processes which provide value to business and customers but significantly reduce environmental impacts”. Likewise, Kemp and Pearson ([20], p. 3) state that “Eco-innovation is the manufacture, assimilation or usage of a product, service, production process, management or business process which is new to the organization and which may lead to, during its entire life cycle, in minimizing environmental risk, pollution and other harmful impacts of unchecked resource usage (including energy use) as compared to relevant alternatives”. The Europe INNOVA panel concludes that “eco-innovation is the creation of unique and competitively priced products, processes, systems, services, and methods that are able to satisfy human needs and improve the quality of life of people with a life-cycle-wide negligible usage of natural resources (material including energy carriers, and surface area) per unit output, and a minimal release of toxic substances” (cited from Reid and Miedzinski (2008: 7). A study done by Chen et al. (2006, p. 332) gave a comprehensive and exhaustive definition of Green Innovation, as “Green Innovation is defined as the hardware or software innovation technique that is associated with green products or processes, plus the innovation in technologies that are involved in energy-saving, pollution-preventing, waste recycling, green product designs, or corporate ecological management.”Oltra and Saint Jean (2009: 567) define green innovation “as innovations that comprise of new or modified processes, practices, systems and products that help the environment and contribute to environmental sustainability”. This definition includes all the modifications in the product or in the production processes that help in achieving environmental goals and takes into consideration the result of activities involved in innovation without considering the initial intent, including both radical and elemental improvements.

The conceptualization has evolved to more recent definitions such as the ones given by Aguilera-Caracuel and Ortiz-deMandojana (2013, p. 365) – “Green innovation comprises of technological developments that can save energy, prevent pollution, or aid waste recycling and can also contain green product design and corporate ecological management. This type of innovation also contributes to business sustainability as it has a

potential positive influence on a firm's social, financial and environmental outcomes," Albort-Morant et al. (2016), where green innovation is suggested to comprise a critical way to alleviate or avoid environmental damage while making a responsible and optimal use of the existing resources, and Leal-Millán et al. (2016, p. 448), "Green innovation is a strategic requirement for firms, and it offers a huge opportunity for meeting buyers' needs without damaging the environment". Hence, the green innovation idea has transformed from being resource-based to a more comprehensive framework including the firm's agreement with the stakeholder's environmental requirements and demands.

After a detailed study on the topic, Schiederig et al. identified six important features in different definitions of eco-innovations.

1. Innovation Object: Product, Process, Service, Method.
2. Market Orientation: To be competitive in the market/satisfy customer needs.
3. Environmental Aspect: Reduce negative impact (optimum = zero impact)
4. Phase: Full life cycle must be considered (for material flow reduction)
5. Impulse: Intention for reduction m
6. ay be economical or ecological
7. Level: Setting a new innovation/ green standard to the firm

The first two aspects are of general character and apply to almost all definitions of innovations, mentioning that the object for innovation might be the product, the process, service or the method (e.g., business model) and that the innovation should address the user's needs or solve a problem and hence be competitive in the market. Considering the environmental aspect, all the above-mentioned definitions refer to the same point, i.e., reducing the negative impact on the environment. The optimum would be an innovation having zero impact negative on the environment. The next aspect appears in only two of the definitions given by Kemp and Pearson (2007) and Reid and Miedzinski (2008). The authors consider the full life cycle analysis and a complete analysis of all the input and output factors. The purpose is to minimize resource consumption. The fifth aspect explains that the intention for reduction may be for the betterment of the environment or for economic reasons. The sixth and last aspect is concerned about the setting new green standards for the firm as the level of innovativeness has no absolute value.

### **Types of Eco-Innovations**

In an attempt to categorize green Innovation, authors such as Porter and Van der Linde (1995), Hart (1995), Chen at al. (2006), and Chang (2011) agree on distinguishing green innovation into "Green Product Innovation" and "Green Process Innovation".

### **Green Product Innovation**

Although there is sufficient literature available that helps in describing the Green Product, but there is still some doubt about what actually constitutes a green product (Dangelico & Pujari, 2010; Ottman, 1997; Peattie, 1995). Since none of the products has zero impact on

the environment therefore, green products can be labelled as those products that cause less harm to the environment by conserving energy or natural resources and minimizing waste, pollution and use of toxic substances (Ottman et al., 2006). According to Dwyer (2009), “Green Products” are those products having designs, uses and commercialization feasible and economical and at the same time minimizing pollution and the risk to human health as well as the environment. In addition to this, a green product is defined as the product having no or less negative impact on the environment and people throughout its entire life cycle (Wong, 2013). While all the above definition ranges from specific to general, Dangelico and Pujari (2010), concluded that green products can be described in terms of three main environmental aspects, which are; materials, energy and pollution during the different stages of the products life cycle. In relation to green product innovation, it is defined as the new practices in the product development that result in resource conservation, pollution prevention, waste recycling and reducing or eliminating the use of toxic materials (Chen et al., 2006; Ottman et al., 2006).

### **Green Process Innovation**

Green Process Innovation is referred to as the use of eco-friendly technology and manufacturing processes for producing goods and providing services that pose zero or least threat to the people and the environment (Chen et al., 2006; Wong, 2013; Ziegler & Nogareda, 2009). Such type of innovation is not only environmentally apt, but also productive and efficient as it uses the resources legibly (Florida, 1996; Kuo, 2007; Roper, 1997). Also, the scope of green process innovation is on the actual manufacturing process rather than on the generated waste materials (Henriques & Sadorsky, 2007). As per the above definitions, green process innovation can be described as the new practices in manufacturing processes that aim at reducing environmental harm by using environmentally friendly technologies, decreasing the production of waste and using less resources (Y.-S. Chen et al., 2006; Chiou et al., 2011). The important point to consider is that although green product innovation typically induces green process innovation because of changes in the product ((Bönte & Dienes, 2013), green process innovation can take place without the involvement of green product innovation (Rehfeld, Rennings, & Ziegler & Nogareda, 2009).

Furthermore, authors Chen et al. (2006) and Chen (2008) incorporated additional typologies such as green managerial innovation, which means eagerness of a firm to include green practices and goals into their corporate strategy. Hence these authors classify green innovation as:

1. Green Product Innovation
2. Green Process Innovation
3. Green Managerial Innovation

Recently, a new typology has been added called the “Green Technological Innovation”- new green equipment and innovative green production technologies that result in developing green products and services.

Another taxonomy classifies green innovation into:

1. Reactive green innovation.
2. Proactive green innovation.

Chen et al. (2012) defines reactive green innovation as the decisions and actions that a firm implements submissively, conforming to legislations, environmental standards, or institutional norms. Besides, the term proactive green innovation describes those organizational behaviours that provide an orientation to develop new and innovative products, services and advanced processes as compared to the competitors. This in turn seeks to attain leverage in the market and to achieve competitive advantage (O’Connor et al. 2008).

### **Why Green Innovation?**

The reason behind companies shifting towards green innovation is not only because of strict government regulations or competitive pressure but due to the fact that implementing environmental management policies opens up a number of opportunities for the companies.

- Incorporating Green Innovation enhances the economic and social performance through cost, waste reduction and other inefficiencies.
- It also attracts new customers. As per Nielson Global Corporate Sustainability Report, 66 percent of the customers are willing to pay extra for sustainable products.
- It can improve the market position of a company by giving it an edge over its competitors.
- Companies can Create breakthroughs by contributing to environmental causes and groups or by raising awareness among the consumers.

### **How can Green Innovation be achieved?**

Since companies have now realized the importance of Green Innovation, for them it is both an opportunity as well as a challenge. Many organizations are now redefining their internal processes to improve their product’s environmental performance over its whole lifecycle which comprises of procuring the raw material for the product to its final usage and disposal. Nevertheless, switching from conventional to green is not very easy. Therefore, an organization needs a clear roadmap to reap maximum benefit. Here are some important points related to implementation of Green Innovation in an organization.

- **Begin by making small changes:** New organizations should start their journey by making small changes in their manufacturing and development process within a specified protocol.

- Create a roadmap: This means shifting to new raw materials, new ideas of production, and new machinery, that are eco-friendly as well as profitable. Going “Green” from “traditional” will require some efforts to make bring it completely into the system.
- Build support: Involve potential partners, such as stakeholders and those whose resource backing is essential for you and in turn who will benefit for your innovation. A company’s requirements as well as the requirements of the members included needs to be taken into consideration.
- Modify companies’ strategies to gain a competitive advantage: The underlying rules of an organization needs to be reshaped so as to overcome barriers that hinder the path of innovation.

### **Conclusions and directions for future research**

Nowadays, Green Innovation is considered as the firm’s capability that might provide it with a chance of achieving competitive advantage by the creation and development of innovative products, services, processes and technologies that aid in reducing the harmful environmental impact. Therefore, such innovations have the potential to reduce the environmental harm and also optimizes the usage of available resources (Albort-Morant et al. 2016).

The field of green innovation is still in its infancy and stems from a very specific framework of literature, but the topic is growing in importance and the information related to it predominantly takes place through conferences and academic meetings. Since the idea of green innovation is new, therefore finding gaps in recent field seems to be easier as there is much more yet to be discovered.

Although a number of researchers are currently attempting to reveal and highlight key issues that cover the green innovation topic, however it still remains open for modifications with regard to even the most basic aspects including definitions, typologies etc. As there is room for ambiguity, there is a considerable rise in the volume of research papers, specialized sessions, workshops and conferences on green innovations. Furthermore, additional empirical data and evidences are required to validate theoretical concepts and shed light on various research questions that might arise.

To summarize, people’s as well as firm’s concern about the environmental is increasing because of the global environmental issues, such as global warming, ozone depletion, etc. Companies and consumers now understand that by joining hands they can work towards conservation and protection of the environment. Also, green innovations lead companies to attain greater efficiency, create competitive advantage and enhance their core competencies, which may together lead to firm’s superior performance (Wong, 2012)

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