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UNDERSTANDING ECO-INNOVATIONS – A STUDY

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ABSTRACT
As a result of the global environmental crisis, which includes a shortage of resources, the degradation of the environment, and pollution, nations from around the globe have been compelled to pay more attention to sustainable development. The development and implementation of environmentally friendly technologies are often regarded as the most efficient and cost-effective means of lowering environmental pressure while maintaining economic competitiveness. Consequently, eco-innovation has become a must for firms seeking a competitive edge and pursuing sustainability in the face of rising environmental pressure.

The primary objectives of this article are to clarify the concept of eco-innovation and emphasize its significance in determining the impact of eco-innovations on overall environmental performance. This study is conceptual in nature based on the reviewed literature. This study also discusses the drivers and motivations for the adoption of eco-innovation. Contributing to a theoretical definition of the idea of eco-innovation and conceptualizing eco-innovation has a considerable impact on the nature of empirical investigations that are carried out, in addition to the actions that are taken for policy and strategy.

Keywords: Eco-innovation, environmental innovation, green innovation

INTRODUCTION
Today, firms are faced with a number of environmental challenges such as pollution, scarcity of natural resources, global warming a growing demand for environmentally friendly products. Aware living in world with finite resources, cleaner production has promoted green technology as tools for resource efficiency. Green technology is the solution that will provide a balance in terms of the environment, economics and society. Practitioners and academia are discovering the substitute for green energy sources and production (Kamarudin Bakar et al., 2011). Eco-innovation is not only focusing of production process to reduce the pollution load on the environment but it also makes good business sense as prevention technique. In recent decades, the expansion of economic activity is a contributing factor to the global environmental problems such as global warming and resource scarcity. However, as businesses are responsible for the environmental concerns, companies are seen shifting from traditional practices to greener practices (Laperche and Uzunidis, 2012; Ekins, 2010; Tyl, Millet and Vallet, 2010). The expectation is that the management of a firm should help shoulder the burden by practicing eco-innovation, which will benefit the entire ecosystem with an increased quality of life (Fernando et al., 2016). Firms can meet sustainable business performance in the aspect of economic, social and environment through eco-innovation (Olsson and Galaz, 2012; Pujari, 2006). In today's business practices, it is vital to know how firms can create and add value (environmental and monetary) to their products and services through innovation. It is also critical to create and increase the awareness of eco-innovation among the business world.

Eco-Innovation – the concept
There are four different notions/terms used in the literature to describe innovations that have a reduced negative impact on the environment: "green", "eco", "environmental" and "sustainable". The Brundtland report, commissioned by the United Nations, was the one which coined the term "sustainable innovation", defining it as meeting the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development does imply limits – not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities (Brundtland, 1987, p. 24).

The eco-innovation notion was derived from the concept of sustainable development created by the World Commission on Environment and Development (OECD, 2008). Eco innovation includes process innovation in production activities to produce environmentally friendly products. According to European Commission (2008), eco-innovation is: The production, assimilation or exploitation of a novelty in products, production processes, services or in management and business methods, which aims, throughout its lifecycle, to prevent or substantially reduce environmental risk, pollution and other negative impacts of resource use (including energy) (p. 11).

In a broad sense, innovations are considered eco-innovative when they are inspired by ecodesign (A. Smith, Voß, & Grin, 2010) and when their goal is to reduce the environmental impact and to develop new technologies,

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products, or processes for the reduction of pollution in order to develop more renewable and sustainable technologies and to improve waste processing and sustainable services (Kemp & Pearson, 2007; Kemp & Pontoglio, 2011).

Focusing on "green", "eco" and "environmental innovation", Schiederig et al. (2012) observed that despite "environmental" innovation being the currently predominant term; since 2005, the notions "green" and "eco-innovation" became increasingly used in scientific publications. Besides this, Schiederig et al. (2012, p. 182) identified six important aspects in the different definitions: (1) Innovation object: Product, process, service, method; (2) Market orientation: Satisfy needs/be competitive on the market; (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 may be economical or ecological; and (6) Level: Setting a new innovation/green standard to the firm.

Table 1. Definitions of Eco-innovation

Author (Year)	Definition
Fussler and James (1996)	The process of developing new products, processes or services which provide customer and business value but significantly decrease environmental impact.
Hemmelskamp (2000)	Effect Innovation which serves to prevent or reduce anthropogenic burdens on the environment, clean up damage already caused or diagnose and monitor environmental problems.
Rennings (2000)	Innovation processes toward sustainable development.
Charter and Clark (2007)	A process where sustainability considerations are integrated into company systems from idea generation through to R&D and commercialization.
Kemp and Pearson (2007)	The production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organisation (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives.
European Commission (2007)	Any form of innovation aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment or achieving a more efficient and responsible use of natural resources, including energy
Oltra and Saint Jean (2009)	Innovations that consist of new or modified processes, practices, systems and products which benefit the environment and so contribute to environmental sustainability
Carrillo-Hermosilla et al. (2010)	Innovation that improves environmental performance
Kemp and Oltra (2011)	Eco-innovation is context-specific which is why we need research from those countries, by researchers from those countries who understand the broader context and societal processes in which eco-innovation is embedded.
Eco-innovation Observatory (2013)	The introduction of any new or significantly improved product (good or service), process, organisational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole life-cycle.

Source: Adapted from Gonzalez-Moreno. et al. (2013)

The ECO-DRIVE study (CML et al. 2008) suggests that eco-innovation should be analysed on three levels: • micro (product or service, process, company); • meso (sector, supply chain, region, product system/service system); and • macro (economy-wide: nation, economic blocks, global).

Driving Factors to Eco-Innovations

Previous studies on the drivers of eco innovation was largely dominated by technology push and market pull theory (Rehfeld & Rennings, 2007) also in supply and demand side drivers (Triebswetter & Wackerbauer, 2008). Technology push in particular is necessary for the initial stage of the innovation and market factors play out in the diffusion of innovation. Both factors are imperative for the successful innovation. However, another factor appeared in the empirical studies and academic literature.

Several recent studies on environmental innovation emphasize on the regulation and policy and institutional effects (Porter & Linde, 1995; Oltra, 2008; Horbach, 2008). Also, according to Horbach & Rennings (2007), the

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general innovation theory has been enhanced by the influence of the regulatory policy and categorized the drivers of eco-innovation mainly in three categories demand side, supply side and regulatory and policy side drivers. According to a study on data collected from 442 Chinese firms to investigate the relationship among the drivers, eco-innovation behaviour, and firm performance. The results reveal that certain factors (i.e., technological capabilities, environmental organizational capabilities, a market-based instrument, competitive pressures, and customer green demand) contribute to the development of eco-innovation. Competitive pressure provides firms with the greatest incentive to adopt eco-innovation, followed by a market-based instrument, technological capabilities, customer green demand, and environmental organization capabilities. The market-based instrument is effective in inducing eco-innovation, while a command-and-control instrument does not. With regard to the adoption of eco-innovation, we show that eco-innovation behaviour can significantly enhance a firm's environmental performance, and, through environmental performance, has an indirect positive impact on its economic performance (Cai and Li, 2018).

According to the resource-based perspective, for a corporation to maintain a competitive advantage over its rivals, its resources must be scarce, valued, difficult to copy, and irreplaceable (Barney,1991). We refer to the two categories of necessary internal resources outlined by Sarkis et al. (2010), namely technological and environmental organizational capacities. The findings of another study indicate that the development of eco-innovation is influenced by a number of elements, including customer desire for environmentally friendly products, technological skills, environmental organizational capabilities, a market-based instrument, and competitive pressures (Cai and Li, 2018). In another study, the determinants of eco-innovation have been classified into the following categories: technology, market, regulation, and firm-specific factors (Horbach, Rammer, & Rennings, 2012).

CONCLUSION

Pervious research has concluded that an organization's environmental performance can be significantly boosted through the adoption of eco-innovation practices. However, there is no direct effect that has a considerable bearing on the performance of the economy. Eco innovation is the process of making existing products, processes, technologies, and infrastructures more environmentally friendly. This process can help lessen the amount of damage done to the environment. As a result, the use of eco-innovation has the potential to lessen a company's consumption of energy, the amount of waste it generates, and the number of environmental accidents it causes, while also improving the company's environmental image and performance. However, it can be challenging to achieve short-term economic gains from eco-innovation because of the high costs and risk that are connected with it. As a result, eco innovation does not have an effect that is directly related to financial performance (Cai and Li, 2018).

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