

# Firm's Sustainability and Societal Development from the Lens of Fishbone Eco-Innovation: A Moderating Role of ISO 14001-2015 Environmental Management System

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## **Abstract:**

Eco-innovation has gained considerable attention in academia as well as in industry due to its potential in mitigating environmental challenges and its positive correlation with firm performance. However, there are limited studies which have investigated the moderating relation of International Organization for Standardization (ISO) 14001:2015 between eco-innovation and firm sustainability in their contribution to societal development. This research is supported by a resource-based theory which explores the core-competencies of firms and challenges the resources creating the competitive advantage of the firm without compromising on the social responsibility aspect of the firm. This study proposes a fishbone eco-innovation business model, which includes production (product, process, and technology) and non-production (organization and marketing) business activities mapped with the 17 Sustainable Development Goals (SDGs) for societal development. This fishbone eco-innovation business model signals to the stakeholders about the organization's innovation in their green implementation, which goes beyond mere compliance. The contribution of the fishbone eco-innovation business model to societal development will create a unique competitive edge and green goodwill amongst the external stakeholders, which will attract sustainably responsible investors for investment. This article draws propositions and develops a conceptual model for future empirical research on eco-innovation and societal development.

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## Article

# Firm's Sustainability and Societal Development from the Lens of Fishbone Eco-Innovation: A Moderating Role of ISO 14001-2015 Environmental Management System

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**Abstract:** Eco-innovation has gained considerable attention in academia as well as in industry due to its potential in mitigating environmental challenges and its positive correlation with firm performance. However, there are limited studies which have investigated the moderating relation of International Organization for Standardization (ISO) 14001:2015 between eco-innovation and firm sustainability in their contribution to societal development. This research is supported by a resource-based theory which explores the core-competencies of firms and challenges the resources creating the competitive advantage of the firm without compromising on the social responsibility aspect of the firm. This study proposes a fishbone eco-innovation business model, which includes production (product, process, and technology) and non-production (organization and marketing) business activities mapped with the 17 Sustainable Development Goals (SDGs) for societal development. This fishbone eco-innovation business model signals to the stakeholders about the organization's innovation in their green implementation, which goes beyond mere compliance. The contribution of the fishbone eco-innovation business model to societal development will create a unique competitive edge and green goodwill amongst the external stakeholders, which will attract sustainably responsible investors for investment. This article draws propositions and develops a conceptual model for future empirical research on eco-innovation and societal development.

**Keywords:** eco-innovation; firm sustainability; fishbone diagram; societal development; ISO 14001:2015; environment management system

## 1. Introduction

Weapons of mass destruction, life-threatening weather, natural catastrophes, climate change, and clean water crises are the topmost five risks that will have significant impacts in the next 10 years in the world [1]. Surprisingly, all five risks are directly and indirectly related to the environment and society, where these environmental risks are the central strategic issues for corporations and societal development. However, in the recent lockdown, steps taken by most countries in the worldwide Covid-19 pandemic ironically minimizes the environmental risk by improving the air quality and temperature around the world within a short period of time. This is primarily because carbon dioxide gas emissions into the atmosphere are reduced based on less industrial activities. This issue is noticeable but not enough for environmental sustainability [2–6]. The Covid-19 pandemic not only affects the air quality index but also affects social mobility during the lockdown because the lockdown demotivates social gatherings. Because of social gathering restrictions, societal expansions and growth are trapped in a cartage stage. As a result, business corporations face different issues regarding this pandemic

in relation to sustainable societal development, such as health, supply chain, labor force, and cash flow [7,8], where most situations demand that environmental risk and societal growth issues be reconsidered post-COVID-19 pandemic in their sustainable business model to grab the full phase of sustainability for society.

Besides the COVID-19 pandemic, the imperativeness of environmental and societal development issues can also be understood by referring to the United Nations 17 sustainable development goals (UNSDG), in which the environmental loss is at US \$2.2 trillion in the year 2018. However, the amount is still increasing due to traditional innovation approaches and GDP (Gross Domestic Product) investment and initiatives towards protecting the environment. The amount of global GDP financed in research and development (environment) increased from 1.52 percent to 1.68 percent from 2000 to 2016 [9], which does not match up to environmental losses. Hence, business corporations need to screen investment not only for sustainable business but also for innovative practices towards environmental challenges that lead to a competitive edge for the company and contribution towards societal development.

The motivations of this study are divided twofold. Firstly, due to the rapid boost in climate change and global warming, the whole world is undergoing a severe environmental problem, which creates a hindrance to social development. According to [10], 2.7 billion people are at risk due to climate change. Secondly, in the era of the Internet of Things, artificial intelligence, and the information age, organizations are still following traditional business models and end up emitting 36.83 billion tons of CO<sub>2</sub> and 7.70 million tons of solid waste, as well as seeing an increase in energy demand by 2.3% in the year 2018. Therefore, the current business model needs to be replaced with sustainable practices to boost the existing societal development velocity, which is another motivation for this research.

There is evidence that the fourth industrial revolution plays a crucial role in sustainability and societal development. It is claimed that the fourth industrial revolution has been initiated by vast scientific research and sustainable technological developments. These sustainable technological developments attempt to mitigate environmental risk and accelerate societal development through different techniques. A study of [11] stated that business corporations require environmentally friendly innovations to control environmental risks and promote societal development. On the other hand, the United Nations also supports environmentally friendly innovations through the Sustainable Development Goals (SDGs) 2030 plan to protect the environment and society through sustainability from current and future threats.

There is a growing body of studies that identify the importance of different forms of innovations relating to the environment and social development—namely, general innovation, green innovation, eco-innovation, and social innovation. Amongst all, the existing literature claims that eco-innovation has emerged as one of the utmost dynamic innovations for firm sustainability [12–14], whereas social innovation has emerged as a vital player in societal development [15]. The objective of this study is to investigate the effect of eco-innovation on societal development, including a firm's sustainability.

Eco-innovation depends on several determinants, such as green demand and supply, green regulation, green collaboration, green resources, and capabilities. These predeterminants accelerate the reduction in materials, improve energy efficiency, minimize emission, improve biodiversity, and raise living standards [16,17], as well as providing competitive advantages for the firm. These factors promote the three pillars of sustainability: sustainable competitive advantages, reduction in cost, and savings in energy. Improving emissions, biodiversity, and energy efficiency are related to the environmental pillar of sustainability, but the reduction in materials, improvement in energy efficiency, minimizing of emissions, and improvement of biodiversity are directly related to the social pillar of sustainability. Therefore, this study draws an argument that eco-innovation accelerates not only a firm's sustainability but also social development.

On the other hand, there are some other external factors that moderate eco-innovation. Among them, International Organization for Standardization (ISO) 14001:2015 is the most accepted standard which promotes environmental management. According to ISO's recent statistics, this is the

second most popular business certification, and is implemented by approximately 200 countries all over the world. In addition to that, this business certification has improved 8% of the annual growth of companies around the globe [18–21]. This situation clearly demonstrates the certification's benefit, as it accelerates the firm's sustainable practices [22] and cost-saving through waste management, water management, the identification of environmental risks and opportunities, environmental compliance, employee engagement, and the promotion of safety practices. The said factors enhance trust amongst stakeholders, create green intentions, and help to portray the firms as responsible firms towards society. Therefore, this study claims that the ISO 14001:2015 certification moderates the nexus between eco-innovation and firm sustainability to enhance societal development. The following table gives a summary of the study of eco-innovation, firm sustainability, ISO 14001:2015, and societal development.

Table 1 highlights the gap from previous studies on eco-innovation concerning the business production process, which highlights the role of products, processes, technology, organization, and marketing with positive and negative correlations with sustainability. On the other hand, numerous studies have been conducted in the last few decades on firms' sustainable practices, innovation, social innovation, and environmental innovation in relation to stakeholders' contributions. Those researches argued the positive impact of eco-innovation on societal developments. However, there is still limited research being conducted on predicting the role of corporate eco-innovation practices on societal development.

**Table 1.** Summary of past studies on eco-innovation, firm sustainability, societal developments, and International Organization for Standardization (ISO) 14001:2015.

Reference	Eco-Innovation Dimension	Firm Sustainability Dimensions	Societal Development	ISO 14001:2015	Theory	Methodology	Findings
[23]	Technology	Environment	No focus	-	Resource-based view	Quantitative	Negative association
[24–28]	Marketing	Environmental, economic and social	Focus on social value addition	-	Resource-based view	Quantitative	Positive association
[29]	Organization	Social and environmental	Focus on employees' living standards	-	Resource-based view	Quantitative	Positive association
[30]	Product	Social and economic	Focus on product social value	-	Resource-based view	Quantitative	Negative association
[23,31–33]	Process	Environmental and economic	No focus	-	Resource-based view	Quantitative	Positive association
[34]	Technology	Environment, economic and social	Focus on sustainable social consumption patterns	-	-	Qualitative	Positive association
[35]	Technology	Environment, economic and social	Focus on societal natural resource allocations and utilization	-	-	Qualitative	Positive association
[34]	Organization	Social	Focus on policies and principles for societal transparency	-	-	Mixed	Positive association
[36]	Organization and technology	Social and environmental	Focus on social policy in the E.U. context	Considered as an independent variable in the framework	-	Quantitative	No association
[37]	Product and process	Social and environmental	Focus on the product social life cycle perspective	Considered as an independent variable in the framework	-	Quantitative	Positive association
[38]	-	Social	Focus on higher education institutions	Considered as a factor of sustainability practices	-	Qualitative	Negative association
[39]	Processes in eco-innovation	Social and environment	Focus on sustainable industrial process management and SDGs	Considered a sustainable effect on society	-	Qualitative	Positive association
[40]	Organizational eco-innovation	Social	Focus on employee sustainability through the social aspect	Considered as a factor that promotes social sustainability	-	Qualitative	Positive association

Table 1. Cont.

Reference	Eco-Innovation Dimension	Firm Sustainability Dimensions	Societal Development	ISO 14001:2015	Theory	Methodology	Findings
[17]	Overall eco-innovation	Environment, social and economic	Focus on economic performance, cost performance, resources savings, pollution prevention, and recycling	-	-	Quantitative	Positive association
[16]	Technology eco-innovation	Economic	Focus on lean management principles	Discussed it. Not considered in their study	-	Quantitative	Positive association
[41]	Overall eco-innovation	Organizational performance	Focus on eco-innovation performance	-	Resource-based and stakeholder perspectives	Qualitative	-

A limited number of studies have been published on the association between eco-innovation and firm sustainability that highlight the three pillars of sustainability. Additionally, there is a scarcity of studies on visual or graphical diagrams specifically related to eco-innovation [42,43], firm sustainability, and societal development. This study propounds the fishbone eco-innovation framework model with the moderating role of the environmental management system (ISO 14001:2015) on firms' sustainability and societal development [42,43].

The problem of the research is that most of the firms are still following traditional and conventional approaches to the environment and innovation, which results in an unsustainable environment that affects the society. On the other hand, there are few firms that concentrate on eco-innovation. However, there are also firms which are not aware of the cause and effect relationship of eco-innovation on societal development. This study also highlights the following questions: "Does eco-innovation affect firm's sustainability? How does the fishbone diagram associate with eco-innovation and firm's sustainability? How does eco-innovation affect sustainability and societal development? How does ISO 14001:2015 moderates the relationship between eco-innovation and firm's sustainability in the development of society?"

Eco-innovation has been gaining a considerable amount of attention from academicians as well as corporate sectors due to its potential in firms' sustainability [44] and societal development. At the micro-level, this research assists firms in taking precautionary steps in scaling up eco-innovation to formulate their business strategies and develop future plans. Besides that, this research can also assist top-level management to promote green and social goodwill, which will influence stakeholders' positive decisions, which could possibly lead the firm's community investment in social development. As a result, firms can build better relationship between internal and external stakeholders, thereby it is also expected to bring a positive nexus on the firm's bottom line.

The remaining section of this study will be discussed as follows: In the next section, the literature will be discussed. In Section 3, there will be a discussion on the proposed conceptual framework, followed by a discussion on future research directions. The conclusion is set out in the final section.

## 2. Literature Review

The definition of eco-innovation was first introduced by Fussler and James in 1996, where it is described as reducing negative environmental impacts while offering new products and processes to consumers and businesses. Eco-innovation also leads to sustainable protection and development by the introduction of innovative ideas, practices, and technologies. Eco-innovation can be described as a modern or substantially changed product, procedure, or business practice that seeks to minimize environmental costs, emissions, and the adverse consequences of resource usage instead of using existing approaches that do not take into consideration the environmental impact.

Many countries have acknowledged that eco-innovation is an impactful way to solve the ecological problems of today, including climate change and energy saving. Moreover, many countries perceive eco-innovation products and services in the market as a source of competitive advantage. Enterprises are seeking eco-innovation as an opportunity to curb negative impacts on the environment while building

a decisive competitive edge and green goodwill in stakeholders' eyes. In addition to that, academic researchers believe that eco-innovation is one of the prime sources to achieve a firm's sustainability and societal development [24,45].

Sustainability can be defined as satisfying needs without compromising the resource capability for future generations' needs. Sustainability literature stands on three pillars—namely, economic, environmental, and social. Therefore, to attain sustainability, the firm needs to contribute on these three pillars. To explore firms' sustainability, this study conducts a detailed review of eco-innovation dimensions.

### 2.1. Dimensions of Eco-Innovation and a Firm's Sustainability

Research organizations such as [46,47] together with researchers—namely, [24,45]—identified five dimensions of eco-innovation, such as product, process, technology, organization, and marketing. The following section will highlight the five dimensions of eco-innovation and a firm's sustainability.

#### 2.1.1. Product Eco-Innovation

Product eco-innovation is designing or improving a product that is new or beneficial in curbing environmental risk in order to enhance sustainability. Product eco-innovation refers to the materials used to produce products that can lower the impact on the environment [24]. Eco-innovation is used to improve the quality of products, services, and sustainability [24,46]. These goods and services emphasize eco-design to diminish the total effect on the environment through their production. [47] defined product eco-innovation by emphasizing its potential users. The introduction of goods or services which are new or significantly better quality concerning their intended uses is known as product eco-innovation [47,48] together with [24], claimed that product eco-innovation is positively associated with a sustainable firm's performance. The studies also pointed out seven specific indicators that are related to increasing a firm's value which focus on the sustainability issue. The indicators are: the usage of new cleaner material or a new input with a lower environmental impact, the usage of recycled materials, a reduction in the use of raw materials, a reduction in the number of product components, the elimination of dirty components, a product with a longer life cycle, and a product's ability to be recycled. It can be argued that product eco-innovation can accelerate competitive advantages and sustainability [48]. In contrast, a study from [30] stated that eco-product innovation negatively correlated with a substantial firm's performance due to the reactive approach of the firm.

This research advocates that product eco-innovation not only helps to curb the environmental risk but also promotes social development. [30] found that the environmental issue is correlated to social challenges. The improvement and reinforcement in the environment will positively minimize the social risk, which leads to achieving the societal development of the economy.

#### 2.1.2. Process Eco-Innovation

According to [30], process eco-innovation is defined as the employment of new or significantly better-quality production or distribution methods which help to reduce environmental impact through significant variations. A study from [47] identified several traits, such as the reduction in material used, lower risk, and cost savings, which improve and strengthen the clean production of the firm.

Cleaner production in the manufacturing process and end of pipe technologies in the production line are the most commonly used terms in process eco-innovation, as claimed by [49]. In accordance with [50], process eco-innovation is no longer confined to explicit environmental performance, but additionally encompasses tacit environmental improvement and sustainable performance.

Several attempts from different researchers [30–33,47,49,51] have been made to identify the nexus of process eco-innovation and sustainable firm's performance. Among them [31–33] stated that process eco-innovation is positively related to a sustainable firm's value. [24] identified 11 specific factors that contribute to an increase in the firm's value. These factors are as follows: a reduction in chemical wastage, a reduction in water usage, a reduction in energy usage, the minimization of wastage,



the recycling of components, the recycling of wastage, innovative environment-friendly technologies, renewable energy for the production process, R&D investment, the acquisition of machinery, and the acquisition of patents [52].

The adoption of eco-friendly factors in the process will maximize the resource efficiency based on the fact that firms and nations which are able to save their limited resources and conduct activities to save their resources will boost their societal development [53]. Therefore, this research advocates that eco-innovation has the potential for sustainable and societal development, which can be verified by the finding from [54] that innovation enhances and strengthens sustainable societal development.

### 2.1.3. Technological Eco-Innovation

In the era of industrial revolution 4.0, the rapid development of technology changes the world constantly. Technological eco-innovation is defined as investments in green equipment and the installation of unconventional green production technologies in an organization. According to [55], technological eco-innovations play a crucial role in providing information to comprehensive material-saving plans and in managing credentials and statistics. The literature claims that firms require huge tangible resources and internal capabilities to implement technological eco-innovation. The study of [23] explained that the complex nature of technological eco-innovation necessitates firms to implement it through specific resources and green capabilities.

Several researchers, such as [44,56], have conducted studies on technological eco-innovation with the nexus of a firm's sustainability performance, with the findings that technological eco-innovation and a firm's sustainability are positively correlated. It is still debatable whether adopting eco-technology operational investments will enhance the efficiency of the production process, minimize the production time, or maximize the output with the same limited resources along with the health and safety of the operational employees. However, due to the capability of maximizing resource efficiency, this research believes that the invention and adoption of technological eco-innovation will help in societal development.

This research advocates that technological eco-innovation can play an enabling role in social development. There are various real-life examples where technologies play roles in social development, such as the case of mobile connectivity and the role of technology in the stock exchange. In a recent example, during the COVID-19 pandemic the whole world became dependent on technology in order to boost economic and social activity and effectuate governing activities. During the COVID-19 pandemic, social development is still progressing in the frozen and melting economy due to the role played by technology. Likewise, it has been evidenced by previous studies that technological eco-innovation not only plays an imperative role in enhancing sustainability but also in societal development as well.

### 2.1.4. Organizational Eco-Innovation

According to [46], organizational eco-innovation is the introduction of a new organizational system in a company's management processes, work-place of a organization, or external relations to delegate roles and decision-making to employees or manage the distribution of work within and amongst client activities. The organizational eco-innovation of the firm involves implementing several environmental policies and directions in motives to curb the environmental impact and boost sustainability.

In the existing literature on organizational eco-innovation, there are several supporting proofs [29,31–33,57,58] in support of the positive association between organizational eco-innovation and firm sustainability. There are several factors primarily responsible for a positive association between a sustainable firm's value and organizational eco-innovation—namely, green human resources, pollution prevention plans, environmental objectives, environmental audits, environmental advisories, investments in research, cooperation with stakeholders, new systems, and new markets [24]—which help firms to contribute to achieving sustainability and social development [29,57].

Organizational eco-innovation and social development have a direct relationship, as the organization establishes the innovation culture and continuously improves its innovation capability.

Apple is an example of a most innovative company, due to the organization's structure and innovation practices. For an example, Apple approved work from home concepts for its employees. This project saves both fuel energy as well as travelling time for employees, which improves societal living standards. Apple organization's structure, innovation, and products have changed the world of modern society, which leads to social development. This research aims to prove that organization eco-innovation is directly linked to societal development, without compromising the sustainability of the firm.

#### 2.1.5. Marketing Eco-Innovation

According to [46], marketing eco-innovation is the employment of new marketing techniques relating to significant changes in product design or packaging, product placement, product promotion, or product pricing. These significant changes help to reduce harmful ecological impacts on society. In addition to that, these significant changes are also aligned with sustainability. To maintain this sustainability of firms, research organizations such as [47] attempted to identify significant marketing techniques that motivate consumers to purchase. According to them, marketing eco-innovation inclines to trace which marketing practices can be employed to inspire people. Hence, it can be in various forms, such as product design or packaging, product placement, product promotion, pricing, and eco-labelling. These forms of marketing eco-innovation are supported by a few researcher, such as [46,47].

In the existing literature on marketing eco-innovation, [24–28] argued that marketing eco-innovation received less consideration than any other dimensions of eco-innovation. However, several researchers such as [24–28] considered marketing eco-innovation in their studies and found a positive association between marketing eco-innovation and a firm's sustainability through the three pillars of sustainability to achieve societal development. According to [24,59], marketing eco-innovation is connected with three perspectives of sustainability, such as environmental, economic, and social. These studies claimed that there are three specific indicators, such as quality certifications, green design packaging, and reusable packaging. These three factors contribute towards sustainability, which is also responsible for the positive association between eco-innovation marketing and a firm's sustainability. In contrast, a study from [60] found a negative association between marketing eco-innovation and a firm's sustainability.

There are also researchers [60] that found a negative association between marketing eco-innovation and a firm's sustainability. On the other hand, there are contradicting arguments that find marketing eco-innovation improves the sustainability for the organization too [24,59]. In addition, marketing eco-innovation can be linked with societal developments. P&G is the perfect example of marketing eco-innovation, as they removed plastic packaging from their marketing concepts. They initiated a project called "alliance to end plastic waste" through their marketing research teams, and they promised society that their company's plastic packaging will be not found in the ocean in future. They contribute to societal developments as well as safeguarding sustainability.

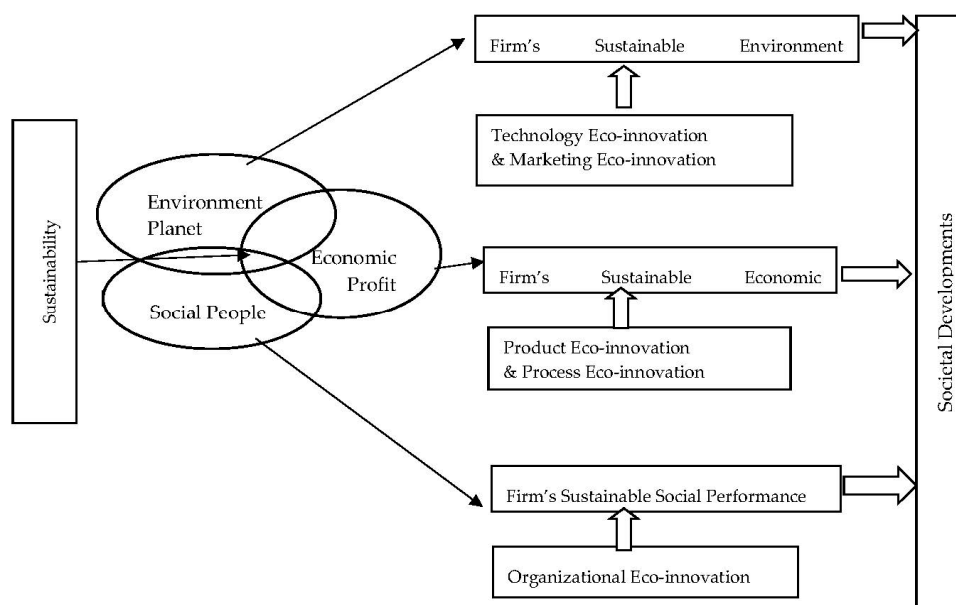
#### 2.2. Three Pillars of Sustainability for Firm

Sustainability stands on three pillars. The pillars are economic, environmental, and social. The three pillars of sustainability are also known as the Triple Bottom Line (TBL) framework in sustainability [61]. In addition to that, the three pillars of sustainability are associated with "three Ps." The three Ps stand for Profit for the economic pillar, Planet for the environment pillar, and People for the social pillar.

It was inferred from the previous studies of [34,61,62] that eco-innovation can affect the three pillars of sustainability. According to the study of [23,30–33], due to eco-innovation practices firms can gain economic profit from cost savings from the manufacturing process, which is connected to product eco-innovation and process eco-innovation. In addition to that, it was argued that environmentally friendly technology, which is linked to technology and the marketing dimensions of eco-innovation, would accelerate the environmental benefits of a firm by introducing new approaches to waste



management and eco-marketing [23–28,44,56]. Furthermore, eco-innovation can accelerate the social pillar of sustainability through promoting green human resource management, which is associated with organizational eco-innovation [29,34]. Therefore, these three pillars of sustainability accelerate societal developments through firms' sustainable economic performance, firms' sustainable environmental performance, and firms' sustainable social performance. The following Figure 1 demonstrates this graphically, and is supported by the previous studies of [62–64].



**Figure 1.** Sustainability and societal development through eco-innovation.

### 2.3. Societal Development

Social or societal development is the process of improving individual well-being within society. Societal development is linked with the three pillars of sustainability [40]. Societal development means investing in people [40]. It is also assumed that there would be no barriers to reach the dreams of every individual within the society with dignity and confidence [34,36,40]. In addition to that, a few studies [34,36,38] have claimed that societal development is important in the sustainable utilization and allocation of societal resources.

The sustainable utilization and allocation of limited resources within society largely depends on firms' management activities, as firms possess a significant portion of social resources [40]. The eco-innovation and sustainability practices of firms are part of modern firms' management activities. These activities, such as eco-innovation and sustainability practices, can be a great solution to accelerate societal development [34,36,38,40].

According to the studies of [29,34], societal development is linked with organizational eco-innovation. In addition to that, a study from [40] illustrated that worker's health, employee turnover, employee training, employee involvement in local community activity, and working conditions are the top five most favorable factors in the social dimensions of sustainability. These five factors represent more than 50% of the social dimensions of sustainability factors. Surprisingly, these five factors are also connected with organizational eco-innovation. Therefore, it has been established from previous literature that eco-innovation and firms' sustainability practices help to accelerate societal development.

### 2.4. The Moderating Role of ISO 14001:2015

The Environmental Management System (EMS) or ISO 14001:2015 is a set of rules, regulations, and guidance for businesses to be followed during operational and non-operational activities [65]. It has been adopted by businesses all over the world since the introduction of EMS. Recently, in the year

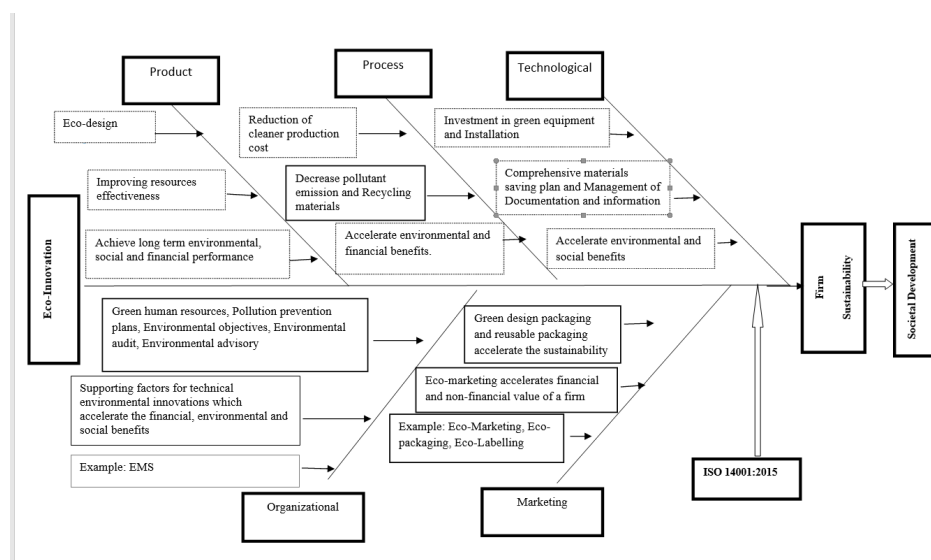
2015, EMS (ISO-14001) added risk and opportunity, which include the environmental dimensions of a product and the product development cycle [21]. The prime focus of EMS-14001:2015 is to improve the environmental performance by implementing the sustainable and efficient use of resources and reducing waste. Various studies have revealed similar sets of research results, showing that ISO 14001:2015 enables a business corporation to reduce the environmental impact of their operational and non-operational activities [21,66,67].

The growth in the number of certified organizations around the world is increasing at the rate of 10 percent annually, which is a clear proof of the popularity of gaining the certification among investors and organizations. Several studies have identified that the ISO 14001:2015 standard has a positive impact on various aspects, such as the company's brand [68], which conform with laws and the minimization of pollution [69]. Despite that, there are also reports which have disputed that the standard provides beneficial effects on environmental sustainability [70], arguing that the implementation of ISO 14,001 does not contribute to substantial changes.

However, based on previous studies that have proved the fact that the implementation of the environmental management system affects a firm's eco-innovation, sustainability, and societal development, this research highlights that the moderating effect of ISO 14001:2015 is also directly in a nexus with societal development, as ISO 14001:2015 supports all five capital (environmental, social, human, technology, and finance) needs for the firm's operational and non-operational activities which contribute towards the social development of the nation.

### 3. Fishbone Chart of Eco-Innovation, Firm's Sustainability, and Societal Development: Conceptual Framework

This research proposes a conceptual framework in the eco-innovation fishbone model in order to enhance a firm's sustainability and the societal development of the economy. The fishbone chart in Figure 2 illustrates the five dimensions of eco-innovation (product, process, technology, organizational, and marketing). These dimensions are discussed as a critical analysis in the literature review inferred from previous studies that each dimension of eco-innovation is positively correlated with the firm's substantiality and societal development.



**Figure 2.** Conceptual framework on eco-innovation, firm sustainability, societal developments, and ISO 14001:2015 (authors' own elaboration).

Firstly, the product eco-innovation and eco-designed products can increase the effectiveness of resources, whereby product eco-innovation can be designed through highlighting the ISO certification, product disassembly/disposal, product lifecycle, and continuous improvement product. This parameter

of eco-designed products contributes not only towards the environmental pillar but also towards two other sustainable pillars, which are the social and economic components of the firm.

The second variable of the eco-innovation fishbone model is “process”, which advocates a clean process adoption that helps firms to monitor and curb the emission of pollution from the firm’s production and service processes. The process of eco-innovation includes green material, process certification, renewable energy consumption, employee environmental training, waste recycle/disposal, and water eco-consumption.

The third variable of the fishbone model is “eco-innovative technology”, which promotes the development or adoption of green technology in production and non-production activities to utilize limited resources effectively. Although several previous research findings have suggested that green technology is more expensive than normal technology [23], there are other researchers that have supported and provided evidence on its financial benefits to firms in the long run [44,56].

Fourthly, “organizational eco-innovation” is another element of the fishbone eco-innovation model, and highlights green human resources, pollution prevention plans, environmental audits, and environmental advisory boards in the firm.

Lastly, “marketing eco-innovation” is considered another potential cause of a firm’s sustainability. Eco-marketing, eco-labeling, and eco-packaging are some of the examples of marketing eco-innovation. It was claimed that eco-marketing could accelerate the financial and non-financial value of a firm. These causes affect the sustainability of the firm. In addition to that, reusable packaging also helps the environment. As a result, it also improves the sustainability of the firm.

This fishbone research framework model of eco-innovation and the parameters of every element directly contribute towards building a green economy [71]. The eco-innovation fishbone model helps firms to move forward and achieve sustainability, which minimizes material wastage and utilizes resources effectively. The effective and efficient utilization of limited resources without emitting pollution shows the commitment of the individual firm, which then results in enabling conditions and strategies to meet the requirement of people of the nation without creating an extra burden for the future generation. The commitment of eco-innovation also minimizes the direct environmental effect not only on the public but also on other creatures of the world, which leads to a positive effect on social life. Therefore, this research presses the need to improve eco-innovation practices and strong commitments to ISO 14,001 by firms towards sustainability and societal development.

This proposed conceptual framework is backed by the resource-based view theory (RBV). Resource-based view theory is the most applicable theory to enlighten the association between eco-innovation and firms’ sustainability [23]. According to the study of [72], RBV is based on four empirical indicators, which are valuable, rare, imperfectly imitable, and (non) substitutability. These four empirical indicators are used by firms to generate a higher rate of performance. The RBV theory also concentrates on managerial capability to identify the firm’s internal resources, such as assets, unique capabilities, and core competencies, that can deliver higher performance and sustainable competitive advantages compared to the firm’s rivals.

Likewise, eco-innovation is one of the firm’s internal resources, capabilities, and competencies, and has four empirical indicators [23,72]. It accelerates higher rates of firms’ sustainability performance. Moreover, a firm’s sustainability stands on three pillars, named the economic, social, and environment pillars. Likewise, these three pillars of a firm’s sustainability accelerate the high rate of societal development. RBV theory enlightens the nexus of the fishbone model of ISO 14001:2015 as an environmental management system that enhances a firm’s sustainability and societal developments. The firm acquires ISO 14001:2015 certification by investing its internal resources, capabilities, and competences. This certificate accelerates the rate of a firm’s sustainability, which also enhances societal development.

#### 4. Discussion

This research highlights the increasing rate of environmental challenges and effects on society due to current business innovation practices. This study propounds the eco-innovation fishbone model to assist the enterprises in their sustainable practices towards societal development. The eco-innovation fishbone model also highlights the imperative role of ISO 14001:2015 in firm operation, leadership, planning, and improvement in business eco-innovation activities. This research advocates that the eco-innovation fishbone model be adopted in firms' operational and non-operational activities, enhancing firms' sustainability practices. Furthermore, the adoption of fishbone eco-innovation in business activities fulfills the firms' responsibility towards societal development. The following five paragraphs enlighten more on the results gained from each dimension of eco-innovation that are expected from the proposed conceptual model.

The eco-innovation of products highlights eco-design concepts which contribute to a firm's sustainability [43]. According to the study of [73], eco-design is a renovation approach towards product which considers the environmental impacts of its entire life cycle. Eco-design not only lowers environmental impact but also focuses on resource effectiveness [74]. Other major elements that need to be considered while developing or innovating the eco-product are reducing material intensity, renewable energy intensity, product climate change, product recyclability, and durability. These essential elements help a firm's product to be eco-labeled, which leads to achieving a positive effect on the firm's triple bottom line. Further to that, it also helps the firm in the effective utilization of limited resources, which boots the firm's contribution towards societal development.

Another element of the eco-innovation fishbone model is that the process of eco-innovation illustrates cleaner production during the manufacturing process without compromising sustainability and societal development [39,75]. Cleaner production is a strategy that combines various production factors, such as curbing greenhouse emission intensity, water intensity, waste intensity, and energy consumption. On top of that, it also promotes the recycling as well as the reusing of materials [39,75]. Other important elements in cleaner production are rainwater consumption and renewable energy increment. Self-generated renewable energy in the production process can minimize the production cost, which can affect the firm's triple bottom line. Apart from that, sustainability also contributes towards the 17 SDGs by modifying their production processes, which will lead to the firm's contribution towards societal development.

The third element of the fishbone eco-innovation model is eco-innovation technology, which refers to green technology innovation and adoption in the firm's operational and non-operational activities. The fishbone eco-innovation model uses eco-innovation technology due to the capability of green technology, which curbs material consumption, energy consumption, water consumption, waste, and production time, and provides a safer working environment for employees. The adoption or invention of green technology is also promoted by a European policy named the Environmental Technology Action Plan (ETAP) [76], with the objective of utilizing full green technology in industries to protect the environment as well as accelerating economic growth [76]. This technological eco-innovation adoption enhances the production process and contributes directly to the firm's triple bottom line. An example of this is Green Electric Cars, which is an alternative solution for minimizing energy usage [76]. Therefore, it can be argued that fishbone technology eco-innovation is able to enhance a firm's sustainability and societal development if the firm adopts green technology in their production process.

The non-operational element of fishbone-eco-innovation is organization eco-innovation, which highlights different environmental factors such as green human resources, pollution prevention plans, environmental objectives, climate change risks and opportunities, as well as environmental advisories. There are other operational supporting activities, such as green human resource management [40], which includes employee health, employee turnover, environmental employee training [40], employee community engagement, and incident-free working conditions [77,78]. These determinants are also enhanced by being certified with ISO 14001:2015, which is widely accepted for the environmental management system. The certification of ISO 14001:2015 and the

implementation of non-operational elements enhance the firm's sustainability and fulfill the firm's responsibility for societal development [18–21].

The last element of the fishbone eco-innovation model is marketing eco-innovation, which embarks on green packaging, reusable packaging, green design marketing, eco-marketing, and eco-labeling, which highlights the eco-innovativeness of the firm to the company's stakeholder. The marketing eco-innovation raises awareness; attracts stakeholders; and creates green goodwill, which attracts future investment and revenue for the firm. This way, marketing eco-innovation manages balance the three bottom lines, namely the economic factor, without compromising on the environment and social well-being, which attract and retain sustainable consumers. As such, fishbone marketing eco-innovation fulfills the triple bottom line that will guide towards social and sustainable development.

There are several positive and negative findings of eco-innovation on a firm's performance (financial and non-financial). This research highlights the important role of ISO-14001:2015 in enhancing the fishbone eco-innovation business through green leadership, green planning, operation, performance evolution, and the improvement of business activities. The serious implementation of eco-innovation and ISO 14001:2015 will maximize resource efficiency and curb the waste generation, which will affect the firm's triple bottom line. The implementation of eco-innovation can also be enhanced by employing green mindset employees in business operational activities that promote green culture and resource efficiency. The effective utilization of resources and maximization of the output from business activities directly contribute to the United Nations' sustainable development goals. Therefore, it can be claimed that this model has practical applicability in the industry.

The practical applicability of the proposed conceptual fishbone eco-innovation model is applicable in different industries, such as oil and gas, consumer manufacturing goods, the chemical industry, and other industries. In the oil and gas industry, common challenges are oil spills, whereby to control the oil spill chemical engineers have proposed different traditional physical and biological techniques with limitations in expelling the oil totally. The emerging sorption method to expel the oil spill in the oil and gas industry is an exemplary technique of eco-innovation by employing biomass (leaves and husk) for cleaning the oil spill. These eco-innovation methods protect the firm from having environmental fines imposed that affect the firm's bottom line and sustainability [78].

The fishbone eco-innovation model is widely applicable to the consumer manufacturing goods industry, which involves product eco-innovation and process eco-innovation, which are directly allied with the utilization of green materials, waste recycling, and sustainable energy (air, wave, solar, biomass) to reduce the CO<sub>2</sub> emission intensity, which reduces the material consumption intensity (per-product), energy intensity, and water intensity without compromising the product quality [50].

These factors positively minimize the production cost and increase the revenue of the firm. The other non-operational element of the fishbone eco-innovation model (organizational and marketing eco-innovation) is to minimize further supporting production cost by fulfilling the environmental norms of the country as well as raising the awareness of responsible production and sustainable consumption amongst stakeholders. Therefore, the adoption of the fishbone eco-innovation model in the consumer manufacturing industry not only generates revenue but also saves the limited resources for future generation needs, leading to firm sustainability and societal development.

The fishbone eco-innovation model is also practically applicable to the chemical industry; eco solvents (ionic liquids) possess excellent eco-friendly properties, including that they are less toxic, easily renewable, can be used for regeneration, and are recyclable. There are wide applications in the production and purification processes in chemical industries, such as pharmaceuticals, polymers, food processing, and others. Another important application of eco-solvents is in the separation and recovery process from industrial waste effluents and curbing harmful emissions, such as CO<sub>2</sub>, SO<sub>2</sub>, as well as H<sub>2</sub>S [78]. These eco-solvents help in achieving a low carbon society and social development by minimizing the environmental effects on human and aquatic life, which will be achieved with a well-structured firm production, process quality, and revenue generation for firm sustainability.

Lastly, this research intends to extend eco-innovation literature from the lens of fishbone eco-innovation from firm sustainability towards contributing to societal development. In addition to that, policymakers can formulate and amend their environmental regulation, as this study establishes the linkage between eco-innovation business capability and the societal development of the nation.

## 5. Future Research Direction

The future research of the proposed fishbone eco-innovation model can be validated by primary data with large sample size and a meta-analysis on the literature review, which will accelerate sustainability and promote business activities towards the United Nations 17 SDGs for societal development. The fishbone eco-innovation model can also be tested with different manufacturing processes, different service sectors, and different nations. The proposed model can also be used to conduct a comparative study of developed nations, developing nations, and emerging developing nations. The fishbone eco-innovation can also be tested on the role of top-level female employees in achieving firm sustainability and societal development using qualitative and quantitative approaches.

## 6. Conclusions

Eco-innovation has gained considerable attention among academics as well as corporate sectors due to its potential in mitigating environmental issues in addition to having a positive correlation with firm performance. However, there are limited studies that have monitored the moderating relation of ISO 14001:2015 between eco-innovation and firm sustainability, contributing to societal development. This research is supported by resource-based theory, which explores the core-competencies of enterprises and challenges resources in creating the competitive advantage of the firm without compromising the social responsibility of the firm. This study proposed a fishbone eco-innovation business model that includes production and non-production business activities towards the 17 SDGs for societal development.

This fishbone eco-innovation business model is expected to signal to the stakeholders about the organization's innovative ideas that go beyond mere compliance. The contribution of the fishbone eco-innovation business model towards societal development is to create the unique competitive edge of green intention amongst external stakeholders, which will attract investors for investment. Sustainably responsible investors will be inspired to invest by considering the practical applicability of this proposed model, such as energy efficiency, recycling materials, reduction in energy, reduction in carbon emission, green human resource management, zero waste from packaging, and reusable packaging. In addition to that, this proposed model will enhance more sustainable competitive advantages over the firm's rivals, which will also create an impact on the bottom-line performance of the firm. This article draws propositions and develops a conceptual model for further empirical research on eco-innovation and societal development.

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