

## Eco Innovation efforts: A review of dynamic eco innovation practices and new research agenda towards sustainability development

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**ABSTRACT:** The automotive industry is a backbone for nation development and approved as one of the dynamic sector with rapid change of technology capability, customer preferences, and complex management for the auto components. As part of the initiatives to support the ability of current generations to meet their needs without compromising the ability of future generations to meet theirs, firm starting to implement eco innovation in terms of producing an eco product and implementing green process in their manufacturing activities. However, there are low evidence of literature underlines firms capabilities to enable eco innovation as scholars tend to discuss factors from Macro and Meso level. Thus, this paper provide an insight for new paradigm of eco innovation research by introducing dynamic eco innovation practices as an antecedent for eco innovation efforts and indirectly supporting eco performance in triple bottom line effect. Four main factors identified as the heart of dynamic eco innovation practice namely; technology collaboration, green human resource, eco innovation culture and environmental management system strategy. Furthermore, this paper shed light on new research imperatives by proposing a research model with hypothesis development to be tested mainly in the automotive industries and particularly development countries as the background setting.

**KEYWORDS:** Eco Innovation, Dynamic eco innovation practices, sustainability, automotive industry.

### 1 INTRODUCTION

Malaysia, as part of ASEAN countries renown as one's of developing countries in this region who are success on transforming the economy through Foreign direct investment (FDI). The introduction of FDI strategy is not only success on attracting investors, but also spurring the economic growth by the establishment of the manufacturing sectors to develop varies types of product. Due to the outstanding strategies, resulted on the increment of the export earnings since 1970's and rapid globalizations by the manufacturing industries as in [1]. As part of it, the automotive industries have significant contribution in nation development through employment (more than 550,000 employees before and after market) and economic growth (3%-4% GDP per year) via manufacturing and marketing activities [2],[3].This industries steadily growth since 1985 in technology transfer and product development while highly protected by the government [4] because the industries encompass growing number of company (up to 570 manufacturer and 35,000 aftermarket business) and build up from numerous components and suppliers in different industries such as metal, plastic, rubber, Electric & Electronics and others [5],[6].

The increasing of attention and global competition in a sustainability development has forcing the local automakers and suppliers to shift their paradigm in green production. The pressure to eco innovative impetus on worsen of air quality, response to the Global trends of producing hybrid and electric vehicles originated from Japanese, Chinese, and Indian countries [7], [8] and competition with the traditional competitor which are Thailand and Indonesia as in [9]. Therefore, the priority in New Automotive Policy (NAP) released on 20th January 2014 emphasizes on the sustainability implementation in producing auto product; car and motorcycles driven by the alternatives energy resources and emphasizing of green automotive life cycle through 3R concept (Reuse, Reduce, Remanufacturer) as in [8]. The new trend of sustainability development embraces on growing research attention for the effective management of eco innovation efforts.

## 2 LITERATURE REVIEW

### 2.1 NEW RESEARCH IMPERATIVE: DYNAMIC ECO INNOVATION PRACTICE

Sustainability becomes a mantra for corporate business in 21<sup>st</sup> century and new edge of global competition relies on triple bottom line effect [10] specially manufacturing industry [11]. According to [12], eco innovation efforts echoes to the sustainability development through different target; product, process, marketing institutional and organizational. Eco innovation terminology refers as an ecological, environmental, green and sustainable innovation [13], [14] and this topic is new for scholars and provide a fertile ground to groom. Research under the umbrella of eco innovation central in developed countries such as Netherlands, Italy and Germany since 1990 [14] under Macro and Meso level which is focusing in the industry and national policy levels as in [15]. However, lack of growing scholars emphasized on Micro level as in [16],[14],[15] to determine firm capabilities towards green initiatives. As recommended by [17], it is critical to review critically the dynamic capabilities construct based on local context factors specially in Asia and developing countries as reported by [18]. Dynamics capabilities approaches merely used to describe how the firm managers utilized the resources in attempts to win the battles in high technology industries and grounded by the creative destruction. By referring to [19], dynamic define as firms capacity to renew its own competence in order to adapt with the rapid changing in internal and external environment. While, capabilities describe as key role of firm strategic management in adapting, integrating and reconfiguring internal and external skills, resources and competencies to achieve sustainable advantage. Amass findings from the previous researchers from each domains namely new product development [20], [21], [22], innovation management [23], [24], [25] and lastly, eco/green innovation [26],[27] echo to the establishment of dynamic eco innovation practices in four main pillars namely technology collaboration, green human resources, eco innovation strategies, and environmental management system (EMS) strategy.

## 3 PROPOSED RESEARCH MODEL

### 3.1 TECHNOLOGY COLLABORATION

Technology capabilities acknowledge as part and parcel to drive innovation activities, thus firm with higher technology know how in turn enable firm to stimulate economic growth as in [28]. As reported by [29], strategic capabilities, internal capabilities and external capabilities considered as the heart of technology capabilities for competitive edge. However, [30] mentioned that an external capabilities is giving a substantial impact compared the other factors to encourage technology transfer [31] particularly in the automotive industry as in [32]. Furthermore, [17] discovered that inter firms relationship resulted on the higher commitment towards environmental management practices and life cycle analysis (LCA) [33]. Closed relationships between supplier and customer are pivotal to pursuing environmental initiatives through joint R&D activities or knowledge dissemination [34], [35] [30] and environmental regulation as in [36],[37]. Therefore, the technology collaboration between supplier-customers is critical and essential to encourages eco innovation efforts as proposed in the following hypotheses:

**H1:** The technology collaboration practices is positively relates to the eco innovation efforts

Automotive industry considered as the complex and complicated sectors as the process of developing a new car consist an efficient management of time, people and environment as in [38]. Therefore, at the heart of the technology collaboration, an effective customer-suppliers relationship towards improving eco innovation performance is crucial mainly in the automotive industries. As reported in [30], the enforcement of EMS regulations within automotive suppliers have a positive relationship on environmental performance in triple line; environmental product design, reduction of material usage and managerial aspect namely advanced prevention and safety systems at work. In line with the previous agreement, [34] in study of customer-suppliers collaboration between Chinese and UK automotive industries confirmed that strong co-operation between both parties directly effect to the environmental, economy, and operational performance. The benefits of collaboration through understandings customer demands and environmental information indirectly will improved firm's environmental image and return on investment as discover by [33]. Then, the corresponding hypothesis postulate as below:

**H5:** Technology collaboration practice will lead to positive relationship to the eco innovation performance

### 3.2 GREEN HUMAN RESOURCE

Despite of technology collaboration, human resource acknowledge as a backbone to describe firm's dynamic capabilities [20],[39] and sustainable advantage [40]. The important of human resources in supporting strategic innovation [41] and

organizational innovation [42] vastly explored in literature while little systematic research and empirical study on green human resource management [43] specially in the Asian based countries as in [18]. Under the umbrella of green human resource management, there are three main themes prompted in supporting eco design efforts such as product life cycle activities (LCA) [27] and design for environment [33]. Training considered as the heart of green initiatives by many scholars [44], [45], [18] relative to performance base rewards [46], [45], [43], [47], [18] and green team [27], [33], [44], [45], [48]. Thus, a green human resource practice offers fertile ground for research to explain its relationship with the eco innovation efforts. Due to that, the proposed hypotheses explain as below:

**H2:** The green human resource practice is positively related to the eco innovation efforts

As mentioned in the former paragraph, human resource plays an important role for supporting green technology innovation [47] and sustainable development [49]. Even though there is limited knowledge initiate to measure the relationship between green human resource practices with eco innovation effort, but the bold of reality is much evidence established on measuring the impact between green human resources with its performance. Several scholars examines the direct effects from the green human resources practices towards environmental performance as indicated in [47], [50]–[53]. As proposed by [46] and [54], human resource is important to improved firms commitment for the environmental innovation and initiatives [47]. Meanwhile, [50] mentioned that employee training is important to reduce production waste and consumption of hazardous materials. More than that, green human resource is significant to increase employee eco initiatives [55], firm's capability on investigating an alternate technologies and procedures and product quality [51], [52] and improved supplier commitment on environmental certification [53]. Pertaining to mentioned information, the following hypothesis proposed as below:

**H6:** Green human resource practice will lead to positive relationship to the eco innovation performance

### **3.3 ECO INNOVATION CULTURE**

Organization culture recognized as a shared value and believes of the organizations and providing guidance to the employee's perceptions, attitude and behaviour. Culture is considered as the heart of main construct for the dynamic capabilities to enable external absorption and internal integration in new product development [20], [21], [22], innovation management [23], [24], [25] and lastly, eco innovation [26], [27]. [43] in journal titled "*State-of-the-art and future directions for green human resource management: Introduction to the special issue*" discovered that organization culture complement green human resources practices is in order to support environmental management programs [56] and employees eco initiatives [54], [46]. There is a rich stream of literature which is discussing the relationships of eco innovation culture, green human resource and employees green improvement as initiate by [54], [46], also the dimensions of eco innovation culture by [57], [58], [55], but this dimensions lack of empirical evidence [56] to describe managerial cultural factors [33], [59] to support firm eco innovation efforts and performance. Therefore, the hypotheses draw as below:

**H3:** The eco innovation culture practice is positively related to the eco innovation efforts

**H7:** Eco innovation culture practice will lead to positive relationship to the eco innovation performance

### **3.4 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS) STRATEGY**

The aforementioned findings on the critical elements derived from the dynamic capabilities are lies on the complementary items between green human resource and eco innovation culture. However, as proposed by several scholars [55], [54], [46], to ensure the effective employee eco initiatives, the adoption of simultaneous practices as such Environmental Management System is vital for any firms. The arena of business competition is no longer on profit oriented, but relies on the sustainable advantage in economy, ecology and social development. Therefore, the introduction of EMS as one of integrated approach towards improving environmental performance is vital to establish firm environment responsible management as in [60]. The adoption of Environmental Management System (EMS) approved as a critical strategy to bridge firm's environmental innovation [37], [61] and as a motivation to implement environmental product design, reduction of material usage, and management aspect mainly in the automotive industry as in [30]. Thus, the next hypotheses proposed as below:

**H4:** The environmental management strategy practice is positively related to the eco innovation efforts

The implementation of Environmental Management System by firm is not only reflected on the environmental innovation, but also associated with operational performance. As confirmed by [62] in journal tittles "*Effects of Environmental Management Systems on Environmental Management Practices and Operations*", the operations

measurement consist of reducing both waste and cost in the production process while improving on designing better product and improved quality. Furthermore, as captured by [60], the practices as such written and documented EMS procedure with the integration of consistent environmental performance is important on reducing overall cost, lead time while increasing product quality. The importance of written environmental management system and environmental performance management review by top management is widely discuss by scholars and approved as a crucial factors for zero waste and emission [55] and zero defects [63]. Thus, the other hypotheses drawing as below:

**H8:** Environmental management strategy practice will lead to the positive relationship to the eco innovation performance

### 3.5 ECO INNOVATION EFFORTS

Eco innovation recognizes as state of the art for the sustainable development and in turn stimulates growth underline in triple bottom line dimensions; economy, ecology and social. There are many drivers as such external and internal captured under the umbrella of eco product innovation efforts proposed by many authors [30],[64],[36],[30]. The common drivers rest on strict regulation, economic in return, competitive advantage and opportunity awareness. In the another hand, some scholars believed that green commitment rest on the company's initiatives and capabilities as pointed out by [16],[65],[66].Technology collaboration, Green Human resource is part of firm's best practices in managing companies' resources related to enables eco innovation efforts and sustainable development. "Eco innovation cultures" defines as shared values and beliefs of the organization and providing guidance to the employee's perceptions, attitude and behaviour in their daily work and Environmental management system Strategy acknowledge as the heart of firm best practice and described as companies specific planning and vision to be realized. Thus, the development of dynamic capabilities theory served a steady stream of framework for empirical evidence, therefore, the following hypothesis draw as below

**H9:** Eco innovation efforts through dynamic eco innovation practice will lead to positive eco innovation performance

Furthermore, there is some empirical evidence of literature which is discusses the role of eco innovations efforts to mediate the relationship between dynamic eco innovation practice and eco innovation performance. Although a mass findings proposed the significant roles of eco innovations to mediate both relationships, however, little systematic research and empirical study to tested the construct of dynamic capabilities as most of the construct tested in isolation as investigated in [36],[67],[62],[68]. The researchers conducted by [36],[62] confirmed that eco innovations practices mediated the relationship between external drivers as such customer pressure, government regulation and environmental performance outcomes, meanwhile the internal driver as such environmental management system (EMS) and operational performance respectively. Furthermore, having eco innovation in terms of organizational, product and process mediates the relationship between innovation strategy and firm performance [68]. Due the provided findings, supported to the establishment of the next hypothesis as follow

**H 10:** Eco innovation efforts significantly mediate the relationship between dynamic eco innovation practice and eco innovation performance

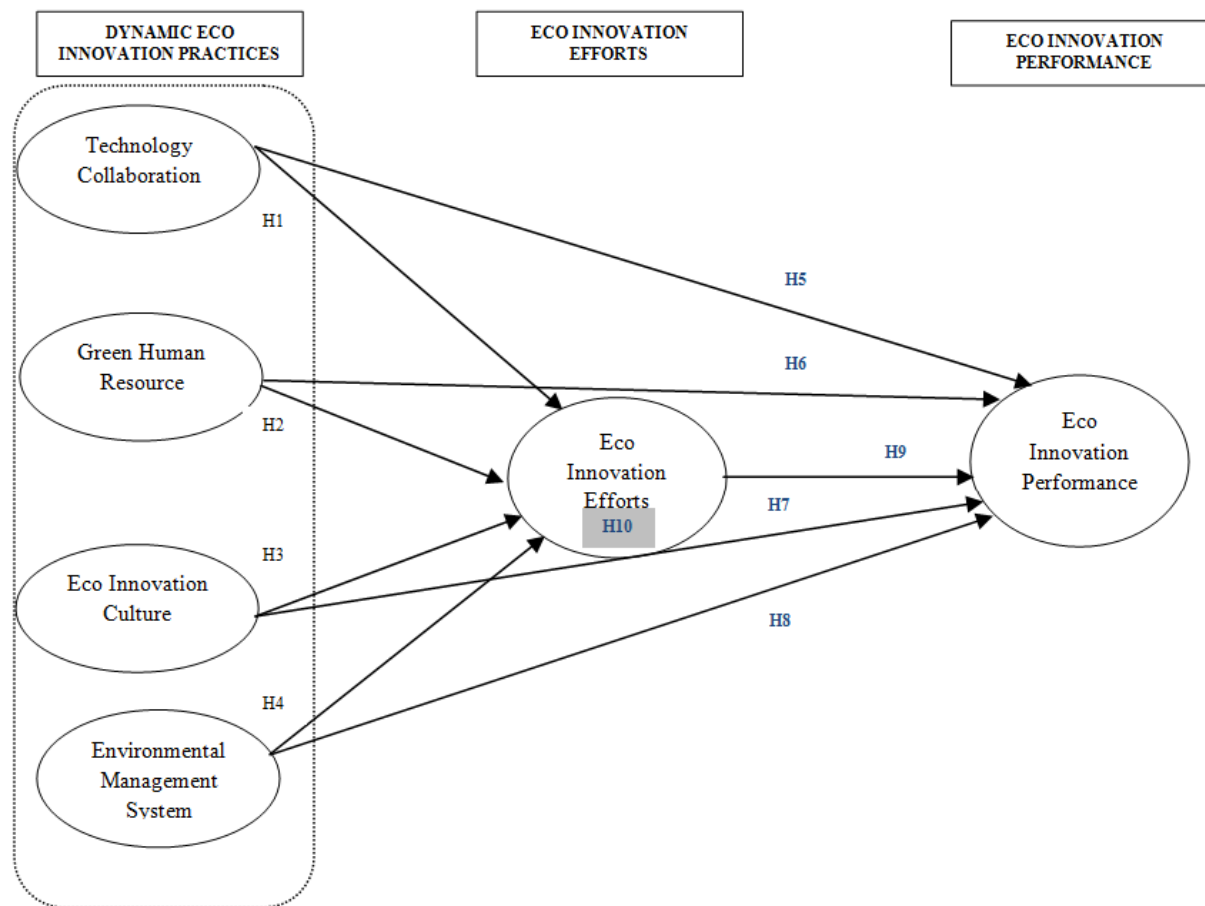


Figure 1: Proposed Model of study

#### 4 CONCLUSION

The ground of competitive edge in the 21st centuries for the automaker relies on greening the industries as initiate by the European automakers and followed by others countries. In the automotive industry, the performance is based on technical advancement in producing better vehicles in efficiency and reliability in the areas of safety, reducing green effects and accessories advancement based on customer demand as in [69]. The introduction of NAP 2014 by YB Dato’ Sri Mustapa Mohamed represented a serious involvement in greening the industries to upgrade Malaysian product and as a strategic weapons to overcomes competitive edge. Thus, it is beneficial to reveals the antecedents of eco innovation efforts based on dynamic capabilities theory.[70] highlighted the important to study dynamic capability for the new comings research agendas to help managers improve the source of firm sustainability by answering “what dynamic capabilities look like in organizations, how they are deployed, and how context may impact upon them?” as in [71]. In a similar vein, scholars and managers are keen to learn about the relationship between dynamic eco innovation practices with eco innovation efforts and its performance as proposed in the figure 1. Furthermore, dynamic capabilities perspective only found in a single study and isolate with each variables to measure eco innovation as the theory come from the “nascent form” and required for the further empirical evidence to refine the model as in[72].

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