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# Management Model for Environmentally Friendly Business Operations of Industrial Factories in Nakhon Ratchasima Province

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**Abstract**

This research was to (1) study the demographic information of executives and company profiles, (2) identify the levels of Industrial Factories Management, Embeddedness of Corporate Social Responsibility Culture, Corporate Innovation, Green Corporate Image, and Firm Performance, and (3) examine the factors of Corporate Innovation and the Green Corporate Image--both qualified as intermediary factors that connect Industrial Factories Management and the deepening of Embeddedness of Corporate Social Responsibility Culture to the Firm Performance. The sample group was the executives of medium and large industrial plants, located in the area of Nakhon Ratchasima Province--200 per group by two-stage sampling method and simplified sampling to re-examine the causal model using AMOS program. The results showed that all factors were averaged at a high level. The analyzed model included executives of medium and large industrial plants located in the area of Nakhon Ratchasima Province with a harmony index of $x^2$ /df = 1.716, RMSEA = 0.045, RMR = 0.015, for the influence curve of all factors affecting the management potential of environmentally friendly business operations of industrial factories in Nakhon Ratchasima Province. The findings pointed to the executives of medium and large industrial factories located in the area of Nakhon Ratchasima Province being able to manage business operations that are environmentally friendly for industrial factories.

***Keywords:*** *Industrial factories management, embeddedness of corporate social responsibility culture, corporate innovation, green corporate image, firm performance, Nakhon Ratchasima Province*

## 1. Introduction and Rationale of the Study

Industry plays an important role in enhancing the economic well-being of people worldwide. It serves as the main factor contributing to the production of goods, employment and the stimulation of technology and innovation for society at large. However, traditional industrial production processes have had a negative impact on the environment, including the health of humans and animals. The United Nations therefore raised the issue of industrial improvement to achieve sustainability by 2036, with a focus on increased efficiency in utilizing resources and technology in cleaner and more environmentally friendly industrial processes (Zameer et al., 2020). The Thai government, through the Ministry of Industry,

began to take the concept of sustainable industrial development as part of its defined guidelines for industrial development in Thailand, to make production environmentally friendly through the Green Industry Project in 2011, which is still in operation. The green project as such has provided assistance and encouraged development in improving the management of environment, safety and energy saving plans (OECD, 2005; Albino et al., 2012; Bathmanathan & Hironaka, 2016).

Environmentally friendly industry or green industry involves the management of factories or industries that utilize resources efficiently, ensure efficient waste recovery in the production process, and prevent pollution by using clean technology for the production of environmentally friendly products (Eco Products). Waste becomes raw materials for other factories (Industrial Symbiosis), emphasizing waste and waste recycling according to the 3R's "Reuse, Reduce, Recycle" principle, i.e., waste reuse, reduction, and utilization of waste/waste materials. The new green industry must have a complete internal and external environmental management system--be it a waste or pollution management system, energy management system, or a set of environmental protection activities within the organization (Aivazidou et al., 2018).

Culture building and industrial networking are considered the highest objectives of the green industry for industrial factories in Nakhon Ratchasima Province because the province appears to have a high potential and can get ready in all the major aspects of the country's economic structure, particularly in the industrial/ agricultural sector and wholesale and retail trade. The operating industrial plants have faced problems in achieving environmentally friendly production to continue their business operations. Those companies that lack competence in adapting to environmentally friendly production, or withstanding the pressure of changing market competitive conditions in environmentally friendly production. Considering those major factors and problems in the business operations of the abovementioned industrial plants, the researchers were able to perceive both opportunities and obstacles facing industrial factories in Thailand that need to change their production processes. Their business operations based on environmentally friendly production or green industry for pollution prevention, appropriate waste treatment, low energy consumption, reuse, recycling, and the use of substitute products. Energy optimization in the industry according to international standards, water conservation, preventing future pollution, service for green production, and environmental surveillance networks, fundamentally creates participation from all parties in the care and conservation of the country's resources and environment--leading to the green industry for sustainable development (Aivazidou et al., 2018; Zameer et al., 2020).

## 2. Research Objectives

The research had three objectives:

1. To study the demographic information of executives and company profiles.

2. To identify the levels of Industrial Factories Management, Embeddedness of Corporate Social Responsibility Culture, Corporate Innovation, Green Corporate Image and Firm Performance.

3. To examine the factors Corporate Innovation and Green Corporate Image as intermediary factors linking Industrial Factories Management and the deepening of Embeddedness of Corporate Social Responsibility Culture to Firm Performance.

## 3. Research Hypotheses

There were six research hypotheses under study:

1. Industrial Factories Management has a positive influence on Corporate Innovation and Green Corporate Image.
2. The deepening of the Embeddedness of Corporate Social Responsibility Culture has a positive influence on Corporate Innovation and Green Corporate Image.
3. Corporate Innovation has a positive influence on Firm Performance.
4. Green Corporate Image have a positive influence on Firm Performance.
5. Corporate Innovation and Green Corporate Image are the intermediary factors between Industrial Factories Management and Firm Performance.
6. Corporate Innovation and Green Corporate Image are the intermediary factors between the deepening of Embeddedness of Corporate Social Responsibility Culture and Firm Performance.

## 4. Scope of Research

The researchers confined this study to a management model for environmentally friendly business operations of selected industrial plants in Nakhon Ratchasima Province. The scope of research covered Industrial Factories Management, Corporate Innovation, Embeddedness of Corporate Social Responsibility Culture, Green Corporate Image and Firm Performance in terms of population, executives of medium and large industrial factories located in the area of Nakhon Ratchasima Province with a total of participating 400 industrial factories in April 2021.

## 5. Terminology in the Study

*Industrial Factories* refer to the economic production of goods, including materials or services. They are places for producing economic goods, where workers process the products themselves or with the help of machines. Such places consist of several buildings filled with machines where workers produce things or operate machines that process product items (Zameer et al., 2020).

*Environmentally Friendly Industry* refers to the internal and external environmental management system, whether it is a waste and pollution management system, an energy management system, or environmental protection activity within the organization (Ormazabal & Sarriegi, 2013). Buildings and industrial networking are vitally important in supporting packaging, product design, concept of the package design used in transporting products from manufacturers to designated consumers-- preferably sourced and crafted from local natural materials that are environmentally friendly.

*Industrial Factories Management* refers to the planning in the manufacturing industry for good operations. It focuses on creating a new standard for the factory, and using the created standards to link production data with reduced inventory costs (Tucker,

2021). An allocated factory system enables efficient production control and planning--making it easier for factory management to help executives gain access to an overview of the company's financial and operating conditions, which in turn affects the decisions made on business operations (Albino et al., 2012).

*Embeddedness of Corporate Social Responsibility Culture* means a practice that is accepted and followed by personnel in the organization. Organizational culture influences the attitudes and behaviors of the members of the organization. It also includes knowledge, understanding (cognition) and values in the organization which arise from members of the organization, and will affect the ideas, beliefs and practices of social norms in the organization (Zameer et al., 2020).

*Corporate Innovation* refers to an organization that has improved and changed its thought processes to create something new, different and useful, from the existing or previous behavior (McKeown, 2008). Whether in the product itself, the production process, the service model, the way the product is delivered to the consumer as well as the management model, operation, system and activities are applied to become a method of practice for the general public (Gibbons, 1997; OECD, 2005).

*Green Supply Chain Management* (*Green Corporate Image*) refers to the process of collecting planning and management before the production of the product, and even bringing products to consumers for maximum satisfaction by various activities in the flow of raw materials, procurement, production, storage, and technological application. Distribution freight which links all processes together with standards creates added value for products and services so that consumers are impressed with products and services (McKeown, 2008).

*Firm Performance* refers to the ability of the organization to use the resources available to produce products with efficiency, effectiveness, meeting standards, and achieving low cost. All these can be achieved by planning and the organization's profit target within the scope of the objectives set for the maximum efficiency of an organization (Tucker, 2021).

## 6. Related Literature

### 6.1 Factory System

A factory system has components of personnel, machinery and the system that works behind the scenes. According to Geffen & Rothenberg (2000), setting up a quality factory system has the following benefits: (1) Creating a new standard for the factory links the created standards with production data. This directly results in good management planning and quick business decision-making--saving time in operations. Moreover, this information can be used to increase quality or reduce additional production costs. (2) Reducing inventory costs helps the allocated factory system to control and plan production efficiently. The result is that the management of raw material allocation in both purchasing and planning better can reduce inventory problems and help manage warehouses more systematically. (3) Efficient factory management helps executives gain an overview of the company's financial and operating conditions, which affects decision-making in business operations (Lucato, Vieira & Santos, 2013).

### 6.2 International Standard Industrial Classification of All Economic Activities

International Standard Industrial Classification of All Economic Activities, abbreviated as ISIC, is a standard established by the United Nations. CE (Conformite Europeene) mark means that the goods conform with European standards. ISO, International Standards Organization, is an international organization on the subject of standardization; the main goal of ISO is to help promote the production of international standards including various related activities. This will lead to better industrial and economic development, especially ISO 14000 as a standard system involving environmental management systems. Emphasis is placed on the organization of continual environmental development for industrial standards in Thailand. Thai Industrial Standards Institute (TISI) has adopted the ISO international serial quality system to improve quality in organizational management. ISO standards are crucial for practitioners to have clear guidelines for them; however, ISO standards require time and funds to implement (Colmenero, Paramio & Garcia, 2019).

### 6.3 Embeddedness of Corporate Social Responsibility Culture

Embeddedness of Corporate Social Responsibility Culture is relevant to all stakeholders in society; for example, the main labor group within the organization, and community groups in the community in which the business is located. The matter of concern rests upon how to treat the labor sector in the management of the organization's resources in terms of money, tools and equipment to support the work, and in terms of knowledge. There will be management of different knowledge requirements of workers at each level, such as hill tribe people, villagers and executives who have different potential to benefit (Leverage Workforce Management). This increases productivity and reduces production cost resulting in a return as a financial value (Financial Value), influencing the value of the environment (Environmental Value), together with social value (Social Value) management of workers in different groups with varying ideas, different educational and religious backgrounds--resulting in divisions of management. Social responsibility is divided into two parts: (1) multiplying labor management (Leverage Workforce Management) (2) creating awareness of environmental awareness (Environmental Awareness Consciousness) (Zameer et al., 2020;Tucker, 2021).

### 6.4 Corporate Innovation

Corporate innovation improves and changes an organization’s thought processes to create something new and different from the former things that exist or have been practiced--be it the product itself, the production process, the service model, the way the product is delivered to the consumer, management model, operation, system or activities (OECD, 2005; Ratchavieng, Srinet & Syers, 2021). Corporate innovation has been widely attempted and become a method of practice for the general public (Gibbons, 1997).

Innovation can help increase the competitiveness of an organization--from the invention of new products, new services, or new processes--to meet the needs of customers. In addition, production innovation increases efficiency in the production process to be flexible, save time, reduce unnecessary production steps, and increase the production volume. Higher efficiency results with lower production costs from bringing in innovation

can help reduce production errors and improve the accuracy of the manufacturing process. Providing quality products through acceptance from customers or users leads to customer satisfaction, loyalty, and profit from higher sales. Creation of organizational innovation accounts for the success and competence of the organization. Innovation can be divided into four types by utilization purposes, namely (1) product innovation. This is the development and introduction of new products, whether through technology, including improving existing products for better quality and performance (Smith, McKeen & Singh, 2006). (2) Service innovation. It brings ideas into operations or uses new technologies to meet the needs and then creates satisfaction for customers. This will also enhance service efficiency and create added value for businesses. (3) Manufacturing innovations. The manufacturing company that has developed superior performance compared to competitors brings new knowledge to be applied in the production process for efficiency, flexibility, and cost effectiveness (Zhou & George, 2001; Vander et al., 2010). Innovation is a matter of change in the organization whether it is the tool, production process, distribution, or organization management model (Sriboonnark, 2020). The goal is to deliver innovative products to consumers or users for their satisfaction with and loyalty to the organization (Matsuo & Kusumi, 2002). Management that responds to modern operations requires new work systems or new ways of working, including new combinations of work in creating new things useful to the management team—even to the extent of virtual management.

### 6.5 Green Corporate Image

Green Corporate Image involves the concepts, beliefs and impressions about the organization's environmental activities that yield environmentally friendly products or services for customers (Kotler & Keller, 2006; Zameer et al., 2020). The goal rests upon sustainability through corporate social responsibility practices. It usually uses a business model that assesses the impact of actions on social considerations and being environmentally friendly for the positive vision of the organization.

Green Corporate Image taps on the internal processes of consumers, or conceptual elements resulting from the assessment of the benefit to consumers, and about the benefits of green products that prompt emotional response from existing and potential consumers. The benefits of green brands bring about consumer loyalty to the organization with its support for environmental protection (Shahid et al., 2020). It also sets an organization apart from its competitors as the first choice when consumers consider purchasing a product. Consumers with strong beliefs in the environmental friendliness of products are more likely to purchase them than competing products especially in industries with high negative external factors (Zameer et al., 2020). As a result, a good image will affect financial performance (Aivazidou et al., 2018). Green activities are worthwhile for organizations only if they are adequately promoted for consumers' awareness of the company's environmental friendliness--followed by their purchase intention. Therefore, companies should build a green image in order to create a better image in the minds of potential customers (Xie et al., 2019). A sustainable green enterprise must take social responsibility into account, both internal responsibility for risk management preparation, quality enhancement, cost reduction, waste reduction, and business-related laws. External responsibilities for environmentally friendly procurement are meant to meet customer needs for innovation (Brand Image) and

for environmentally-friendly products (Green Products). The use of resources with environmental considerations by the management of the green supply chain (Green Supply Chain Management) is initially linked from the procurement to the green supplier. This encourages suppliers to adopt environmental practices and focus on environmentally friendly raw materials. Green organizations can reduce costs, increase profits, use resources cost-effectively, and reduce environmental impact, health and safety risks. CSR is a permanent pattern of business activities intended to be followed and exceeds legal and corporate expectations for the safety and health of employees as well as improving their well-being. CSR contributes to the well-being of corporate society with ethics, morality and environmental standards, reduced use of resources in the organization, and increased energy efficiency in the production process as well as operations.

### 6.6 Firm Performance

The organization's ability to perform on the resources available to produce products with efficiency is to meet standards at low cost, and plan for business goals on success in the operation within the scope of the objectives set for maximum efficiency of the organization.

Firm Performance depends on effective business analyses, and the implementation of strategies to obtain results from the process that the organization has carried out. With different business organizations giving their perspectives on their specific differences in performance to be attained. The final stage of organization occurs as a result of external factors covering three areas: (1) *financial performance,* such as profit, return on investment, and return on assets, (2) *financial performance of marketing,* such as sales and market share, and (3) *the performance of returns for stakeholders or shareholders*, such as total return and economic value (Richard et al., 2009). The end result will be from the production process and comprehensive administration, and both quantity and quality can be assessed and compared to goals or objectives based on historical or comparative performance standards or compared with other organizations according to the objectives set (Ondategui et al., 2004). Assessment of the organization's performance will be the aggregate result in the process, the final result of an activity, or the sum total of the final results of the activities in all processes and all activities of the organization (Gibson et al., 2011), with inputs, outputs, transformation (Transformation) and feedback (Feedback Effects). As for asset management, an organization needs to add value to products and services, build a reputation for the organization, and develop organizational knowledge to create relationships to achieve goals. Organizational goals and the performance indicators of the organization have two dimensions. *Productivity* starts from looking at productivity and production values in terms of performance efficiency and profitability. An organization also requires an outline of a *comprehensive assessment* of profit and productivity for the overall operations.

## 7. Research Methodology

Quantitative Research in Causal Model Examination used data obtained from the questionnaire. The structural equation from latent factors includes Industrial Factories Management and the deepening of Embeddedness of Corporate Social Responsibility

Culture. The intermediary factor consists of the Corporate Innovation factor and Green Corporate Image--leading to the Firm Performance factor.

### 7.1 Research Data

The researchers used theory and research as primary data and a basis for constructing appropriate tools for data collection, herein a questionnaire for the respondents. The secondary data were from related research papers, research theories, and academic work obtained from documents, books, articles, or other relevant sources in the past. The documents used in this research were from Thailand and international sources to secure the concepts, theories and principles of management models in environmentally friendly business operations of industrial factories as pertinent to the industrial context of Nakhon Ratchasima Province.

### 7.2 Population and Sampling Plans

The population used in this quantitative research study included executives of medium and large industrial factories located in the area of Nakhon Ratchasima Province. The sample size was based on the model and therefore relied on minimum values guaranteed to test structural equations using the principle of Cohen (1988) and Westland (2010), and determine the power of test at 0.80, significance level 0.05. This study identified 5 latent variables and 12 empirical variables. The results were calculated with n sample size steps. The minimum was 150 samples. This research used a sample size of 400 units from the population which should guarantee the ability in testing structural equations according to the principle used by Cohen (1988) and Westland's (2010).

### 7.3 Population Scheme

Two-stage sampling was carried out with the following sampling plan: (1) Executives of medium-sized industrial factories located in the area of Nakhon Ratchasima Province: area entrepreneurs in Muangmai Suranaree, Muangmai Pakchong, Muangmai Buayai, and Muangmai Nongrawiang. The researchers used a simple sampling plan: 4 areas, 50 samples per are--making a total 200 samples. (2) Executives of large industrial plants located in the area of Nakhon Ratchasima Province: area entrepreneurs in Suranaree City, Pak Chong City, New Bua Yai City, Nong Rawiang City. The researchers used a simple sampling plan: 4 management groups, 50 samples per area--making a total of totaling 200 samples. The total number of respondents was 400.

## 8. Research Results

### 8.1 Summary of Research Results

The management level in business operations that is friendly to the environment of the industrial factories in Nakhon Ratchasima Province by each factor is shown in Table 1.

**Table 1:** The Management Levels in Environmentally Friendly Business Operations of Industrial Factories in Nakhon Ratchasima by Factors

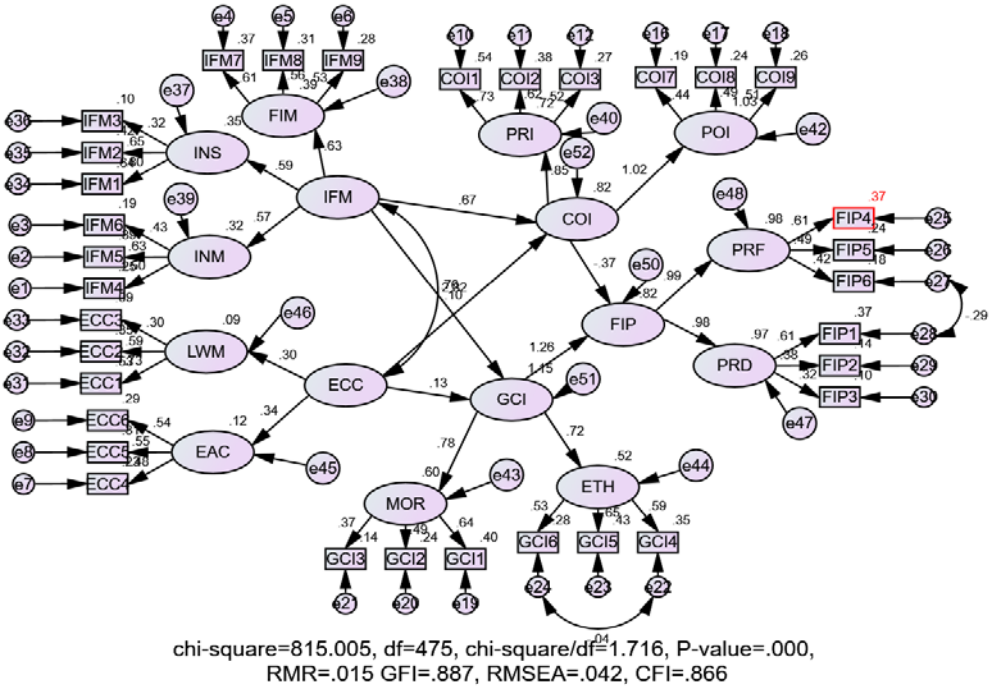
| Factor | Mean | Standard Deviation | Coefficient of Variation | Paraphrase |
|---|---|---|---|---|
| Industrial Factories Management (IFM) | 4.43 | 0.53 | 0.12 | high |
| Corporate Innovation (COI) | 4.47 | 0.52 | 0.12 | high |
| Embeddedness of Corporate Social Responsibility Culture (ECC) | 4.43 | 0.54 | 0.12 | high |
| Green Corporate Image (GCI) | 4.55 | 0.51 | 0.11 | highest |
| Firm Performance (FIP) | 4.48 | 0.52 | 0.12 | high |

Table 1 compares the means of the management factors and the Embeddedness of Corporate Social Responsibility Culture factor as exogenous factors. It was found that the coefficients of variation were equal. The CSR culture's ingrained factors were slightly higher on average. The dependent factor (endogenous factors) consists of intermediary factors. When comparing the Corporate Innovation factor and the Green Corporate Image factor, the researchers found that the Green Corporate Image factor had higher scores and also had a lower coefficient of variation.

### 8.2 Hypothesis Testing in the Research Conceptual Framework

Figure 1 and Table 2 were meant to explain Hypothesis Testing in the Research Conceptual Framework.

**Figure 1:** The Results of the Analysis of the Covariance-based Structural Equation



As shown in Table 2, the test results of the management model in environmentally friendly business operations of the factories industrial work in Nakhon Ratchasima Province revealed the correlation coefficient of the Embeddedness of Corporate Social Responsibility Culture, Green Corporate Image and Firm Performance factors at 0.823, 0.988 and 0.821, respectively, which were classified as high with interpretation as follows: (1) the Industrial Factories Management (IFM) had a positive influence on Corporate Innovation (COI),
(2) Industrial Factories Management factors (IFM) had a positive influence on Green Corporate Image factors (GCI),
(3) Corporate Innovation factors (COI) and Embeddedness of Corporate Social Responsibility Culture factors (ECC) had a positive influence on Corporate Innovation factors (COI), and
(4) Green Corporate Image factors (GCI) had a positive influence on Firm Performance factors (FIP).

**Table 2:** The Coefficients, Standard Deviation and t-Statistic in Hypothesis Testing

| **Hypothesis** | **Standard Coefficient** | **S.E.** | **t-test** | **P-value** | **Conclusion** |
|---|---|---|---|---|---|
| EFM-> COI | 0.969*** | 0.666*** | 6.708 | 0.000 | support |
| ECC -> COI | 0.366*** | 0.099*** | 3.195 | 0.001 | support |
| IFM -> GCI | 0.878*** | 0.764*** | 6.518 | 0.000 | support |
| ECC-> GCI | 0.374*** | 0.128*** | 3.889 | 0.000 | support |
| COI -> FIP | -0.352 | -0.369 | -0.867 | 0.385 | not support |
| GCI-> FIP | 1.527** | 1.261** | 2.992 | 0.003 | support |

*p=.05, ** p=0.01, ***p=0.001

Table 3 displays the factors of Industrial Factories Management (IFM) having a weight of total influence on the Firm Performance factor (FIP) at approximately 5 times higher than the total influence weight of the Embeddedness of Corporate Social Responsibility Culture factor (ECC), with the Green Corporate Image factor (GCI) acting as a variable. The central influence on the Firm Performance factors (FIP) was as high as 1.261, while the Corporate Innovation factor (COI) had the opposite influence on Firm Performance factors (FIP) at -0.369.

**Table 3:** Direct Influence of Factors Calculated from Standard Coefficients

| **Factors** | **$R^2$** | | **IFM** | **ECC** | **COI** | **GCI** |
|---|---|---|---|---|---|---|
| COI | 0.823 | DE | 0.666 | 0.238 | NA | NA |
| | | IE | NA | NA | NA | NA |
| | | TE | 0.666 | 0.238 | NA | NA |
| GCI | 0.988 | DE | 0.764 | 0.128 | NA | NA |
| | | IE | NA | NA | NA | NA |
| | | TE | 0.764 | 0.128 | NA | NA |
| FIP | 0.821 | DE | NA | NA | -0.369 | 1.261 |
| | | IE | 0.718 | 0.125 | NA | NA |
| | | TE | 0.718 | 0.125 | -0.369 | 1.261 |

### 8.3 Model Harmony Index from SEM Covariance-based Analysis

The tests for the harmony of each model of empirical data appear as follows:

$x^2$ /df = 1.716, RMSEA = 0.045, NFI = 0.803, CFI = 0.866, IFI = 0.869, RFI = 0.789, RMR = 0.015. There were 9 standard indices, comprising 3 good fit indexes and 5 Mediocre fit, and 1 Acceptable. It was concluded that the model should be suitable for the empirical data at the valid level.

## 9. Discussion of Results

The results of the evaluated five factors in the research conceptual framework of the sample group in Industrial Factories Management factors overall at the average 4.43 -- a high level with a coefficient of variation of 0.12, which is much lower than 0.30, indicating the respondents somewhat disjointed. The result supported the earlier studies by Russo & Fouts (1997) and (Sambasivan et al., 2013) that emphasized the importance of the environment in the context of the industry, and that executives must play a role and implement the environmental strategy in a concrete way in the dimension of the words "Environmentally friendly industrial management," with factory or industrial management that utilizes resources efficiently, waste recovery recycling in the production process, and prevention of pollution problems by using clean technology (Pigosso, Rozenfeld & McAloone, 2013). In this particular research in 2013, the researchers asserted that the factors of industrial plant management as assessed by the executives in each company under study were at a high level, thus showing a good trend. In addition, all aspects of production management, warehousing and resource management were evaluated by the sample at a high level.

The ingrained factor of the Embeddedness of Corporate Social Responsibility Culture (ECC) culture appeared to have a positive influence on Corporate Innovation factors (COI); and the Embeddedness of Corporate Social Responsibility Culture (ECC) positively influenced the Corporate Innovation factor (COI). Such a result corresponded with the findings reported by Ouchi et al. (1984), Odom (1990), and Ahmed (1998) that pointed to an organizational culture of shared values in the environment as having impact on employees' organizational commitment to environmentally-focused production processes as innovations. Sutton & Kramer (1990) were also in favor of environmental changes, such as knowledge sharing culture as an important foundation for innovation. In addition, the behavior of the organization's employees that expresses their willingness to protect the environment at work and living in society also affects the corporate image of the company they are working for (Alavi & Leidner, 1992; Ipe, 2003).

The result on the Green Corporate Image factors (GCI) positively influencing Firm Performance factors (FIP) agreed with the findings by Kotler & Keller (2006) and Zameer et al., (2020) in that recognition of the image of the organization for the environment of the customer will affect consumers' impression with the organization's environmental activities that benefit customers regarding their purchased products and services--in turn enhancing the value of the products and services. It should be noted that organizational commitment to environmental protection for the future and for sustainability through corporate social responsibility practices has become part of creating value for the business.

This point was earlier expressed by Bathmanathan & Hironaka (2016) and Yadav et al. (2016) that building trust in a Green Corporate Image will lead to customer engagement, support, and sustainability of business, especially those in the new generation of consumers who are environmentally conscious. Creating a corporate image of environmentally friendliness would serve as an organization's strength in competing and increasing market share (Chan, 2009; Geerts, 2014).

As for the unsupported result on Corporate Innovation factor (COI) positively affecting Firm Performance. The researchers interpreted as stemming from uncertainty of product innovation, as 80% of the businesses under study produce capital goods. The outstanding innovation in the product was not visible in the study perhaps accounted by their customers' specific order. Therefore, the result on the impact of Corporate Innovation on Firm Performance in this study could result from the management's focus on the innovation process, while putting more weight on cost reduction and maintaining international environmental standards (OECD, 2005; McKeown, 2008).

### 9.1 Research Benefits

Based on the research findings on the positive impact of Green Corporate Image on Firm Performance expressed by the respondents under study, the researchers would like to touch on two points for environmentally friendly business operations of medium and large industrial factories in Nakhon Ratchasima Province.

(1) In terms of policy on green industries, business operations need to observe international production standards in their clearly-defined plans and objectives for real practice in a concrete manner. In this aspect, companies in the manufacturing industry can jointly create clear guidelines for environmental production using international standards set by the state and transfer it to the practical level in their factory. A common and mutual understanding of green industries should be explicated for sustainable production.

(2) In practice, it is vitally important to promote cooperation in manufacturing innovation regarding the innovation process in the main group of factories in Nakhon Ratchasima Province that directly take orders of products from their customers. Therefore, cooperation in inventing innovations for environmentally friendly production suitable for the area can be done via research and development (R&D) to create new knowledge pertinent to the business group in Nakhon Ratchasima Province. This is to enable the province's industry to manage environmentally friendly production efficiently for harmony with the communities concerned. The important thing is to strengthen the ingrained culture of social responsibility culture in all stakeholders.

(3) Since the results of this research appeared to support the theory of organizational resource management (Resource-based Theory) in organization management, the researchers would like to see further human resource development of the deepening of social responsibility culture expanded as a collective culture (Collectivism) in the context of environmental protection for the well-being of the target society.

**9.2 Future Research**.

Since the country's income was recorded 621,668 million baht in 2020 for the production of capital goods for both export and domestic consumption including the industrial chain and tourism, business operators have become aware of needs for service innovations, especially after the epidemic crisis. In this regard, guidelines for the study of management roles and the development of the service industry deserve a great deal of attention on technological leaps for sustainable support. Those issues on service innovation and technological applications require further research into the dimension of human resources (Soft Assets) in parallel with the management of Machines (Hard Assets) based on the selected theory of management-based resources (Resource-based view). All of these are for all business operators concerned to compete effectively in both the capital product industry as well as the service industry.

## 10. The Authors

The first author Duenphen Phuriruengkit is a graduate student in the Doctor of Business Administration Program, Southeast Asia University, Bangkok, Thailand. Her area of research interest involves environmentally friendly business operations and new business models for the industry in the central/ northeastern part of Thailand.

The two co-authors--Napaporn Khantanapha and Rapeepun Piriyakul--are lecturers and dissertation supervisors/ committee members in the Business Administration Program, Southeast Asia University Bangkok, Thailand. Their academic interest and research lie in the areas of business model formulation, environmental management and green business operations.

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