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Driving Green Innovation to Enhance Competitive Advantage: Thailand's Manufacturing Sector

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Abstract
One of the various strategies a firm can implement to enjoy a competitive advantage is green innovation. This study seeks to examine both the direct and indirect effects of green innovation on competitive advantage by extending the research framework based on the strategic choice theory. Utilizing cluster sampling, data was collected among manufacturers operating in the six regions of Thailand. The direct effect of the three components of green innovation (green product innovation, green process innovation, and green managerial innovation) and the moderating effect of a green orientation were analyzed using the OLS Regression and PROCESS model 1. The findings reveal that (i) the three components have a positive impact on competitive advantage, and (ii) each conditional effect (a strong or a weak green orientation) has a positive impact on the linkage between green innovation and its three components and competitive advantage. Surprisingly, the interaction of green product innovation and weak green orientation provides a greater effect on competitive advantage than a strong one. This is because most executives are concerned with the high costs of eco-friendly raw materials. Ignoring environmental issues, however, can negatively impact the image a firm and cause it to miss opportunities. It is recommended that an executive opts for a certain level of green orientation in order to minimize unforeseen business risks and enjoy a competitive advantage.

Keywords: Green Product Innovation, Green Process Innovation, Green Managerial Innovation, Strategic Choice Theory, Competitive Advantage

1. Introduction

The issue of green innovation (GI) has now been given global attention and is becoming a solution to gaining competitive advantage (CA) and ensuring business sustainability (Begum et al., 2020; Liu & Yan, 2018). The term 'green innovation' was initially used to depict advancement in products, services, processes, and management resulting in longer product life cycle and in the reduction of environmental risk, pollution, and the inefficient consumption of natural resources. GI, however, is now believed to not only enhance environmental sustainability but also CA and business sustainability. In short, there is a strong relationship between GI and CA (Bataineh, 2021; Soewarno, Tjahjadi, & Fithrianti, 2019). According to Qiu, Hu, and Wang (2020) and Song et al. (2020), pressure from environmental restrictions, market competition, and various additional stakeholders have had an impact on the manufacturing sector in almost every country, including in Thailand. The priority is not only business sustainability and the cost and quality of product and the flexibility of its delivery but also environmental and social sustainability (Porter & Kramer, 2006). This is precisely why manufacturing firms need to come up with a green business strategy to address societal environmental concerns (Yahya et al., 2022). An eco-friendly production will positively impact the input, transformation, and output and the operating cost and therefore give the firm a CA. However, for this to happen, a GI strategy must be capable of creating added value. Simply put, today, environmental sustainability is an unavoidable element of any business operation.

As determined by Longoni and Cagliano (2015), among other scholars, environmental sustainability does not confine firms to their usual business practices but on the contrary represents a source of inspiration that contributes to eco-friendly innovation and, as such, is therefore a source of CA. Implementing a GI strategy is not free of challenges (Hermundsdottir & Aspelund, 2021). In the industrial sector, gaining a CA through a sound GI strategy involves 3 forms of innovation: green product innovation (GPDI); green process innovation (GPRI), and green managerial innovation (GMNI). It is strongly believed that GPDI would enhance a firm's CA since the green product created would fulfill a new trend or a green consumers' need and achieve environmental sustainability as well (Andersen, 2021; Cheng, 2020).). GPDI, however, may cause the cost of the raw material used to rise significantly and lower the firm's CA. This is a real challenge for executives having to make the proper strategic choice in terms of green sustainability. A green process could reduce a firm's operating cost, but GPRI involves a trade-off between a huge investment and long-term efficiency as eco-friendly production will achieve both CA and environmental sustainability. In terms of GMNI, obviously top executives are the key players as they have to lead the entire organization into transiting to a green corporate strategy in order to gain a CA through environmental sustainability. This research study focuses on the green orientation (GO) of manufacturing firms located in (i) central; (ii) east; (ii) northeast; (iv) north; (v) south, and (vi) west Thailand. Specifically, through the lens of strategic choice theory, it explores the direct effect of GPDI, GPRI, GMNI on a firm's CA and the moderating effect of its GO on the three GI components and on its CA. The significance of this study lies in its ability to fill the research gap in the different degrees of green orientation (GO) of an executive and its impact on the firm's GI.

2. Literature Review and Hypothesis Development

- Strategic Choice Theory

The strategic choice theory addresses the rationale for adopting proactive strategies to cope with environmental sustainability issues. It describes the role that leaders or leading groups play in influencing an organization through making choices in a dynamic political process (Child, 1997). As an organizational theory, it is rooted in the contingency theory that claims that there is no best way to organize a corporation, lead a company, or make decisions (Child, 1972). It is also based on the assumption that an organization could become more efficient and better perform by appropriately implementing strategies within a specific context (Wagner & Bode, 2008). The implication for this study is that the executives of a manufacturing firm perform a proactive role in deciding on the proper choice of green practice to gain CA and be sustainable. Previous studies reveal that when an executive choses GI as a corporate strategy, the company gains CA and business sustainability (Gurlek & Tuna, 2018; Liu, Dong, & Wang, 2021). Based on the strategic choice theory, an executive thus tends to implement GI into its operating activities to enhance its firm's CA.

- Competitive Advantage

Competitive advantage (CA) is associated with the competitive strategies that a firm can implement to outperform its competitors, leading to a superior position in the rivalry among companies (Porter & van der Linde, 1995). CA is an essential way to differentiate between a firm and its competitors in terms of gains from a business strategy. In general, especially in the manufacturing sector, CA gained from GI can be measured by an increase in product sales, a lowering of the cost of the product, and/or a prompt response to the significant changes in the market, quality improvement, corporate image, and the R&D capability (Hermundsdottir & Aspelund, 2021; Li, Lei, & Han, 2018). Moreover, several studies confirm that GI is a crucial instrument for a firm to obtain a CA in a period of enhanced environmental concerns (Bataineh, 2021; Soewarno et al., 2019).

- Green Innovation

Green innovation (GI) can be defined as the advancement of a product, service, process, and management that has been implemented into an organization, resulting in the reduction of environmental risk throughout the entire life cycle of a product or service. GI also refers to other alternatives to natural resource consumption (Chang & Chen, 2013). As we saw in the introduction, GI can be classified as either: (i) green product innovation (GPDI); (ii) green process innovation (GPRI); or (iii) green managerial innovation (GMNI).

(i) Green Product Innovation:

GPDI relates to the advancement of products that derives from eco-friendly technology. It increases the quality of products and reduces product life cycles, leading to a superior marketing position (Carrillo-Hermosilla, del Ria, & Konnola, 2010). An executive may consider a cost-sharing strategy with the green product movement to gain a CA (Andersen, 2021; Cheng, 2020). In their study, Xie, Huo, & Zou (2019) determined that GPDI can enhance a firm's CA and financial performance. Therefore, the following hypothesis can be proposed:

H_1: *GPDI has a positive linkage with CA.*

(ii) Green Process Innovation:

GPRI represents the new implementation of any green methods in the manufacturing process to enhance efficiency in a friendly environment (Artha & Mulyana, 2018; Haseeb et al., 2019; Banerjee, 2002).). A recent study by Rehman et al. (2021) reveals that a manufacturing firm can and use eco-raw material to enhance an existing process and avoid hazardous waste. Thus, as mentioned by Sun and Sun (2021), an executive is likely to consider GPRI as a crucial component of the firm's GI strategy to gain a CA. Consequently, the author can hypothesize that:

H_2: *GPRI has a positive linkage with CA.*

(iii) Green Managerial Innovation:

GMNI refers to an efficient management practice adopted by a firm as part of its green practice to handle critical issues, such as marketing competition, environmental restrictions, and business operation costs (Chung, 2020). In a recent study, Li, Huang, and Tong (2021), found that an executive had chosen to cooperate with a competitor to create a GMNI strategy for mutual benefits. Furthermore, green transformational leadership can motivate and lead stakeholders to promote GI, thank to which business sustainability and CA can eventually be achieved (Ahmeda, Mozammelb, & Zamanc, 2020; Qiao, Zhao, & Zou, 2020). Thus, the author proposes the following hypothesis:

H_3: *GMNI has a positive linkage with CA.*

Green Orientation

For decades, manufacturing firms have been pressured to develop their green orientation (GO). (Artha & Mulyana, 2018; Haseeb et al., 2019). As a result, they have been increasingly focusing on environmental issues and deploying green strategies. Because of consumer demands for greener products and processes, firms realize the benefits of incorporating GO that provide what consumers want. Executives are forced to recognize consumers' environmental concerns and integrate them into their ongoing business operations. GO thus relates to green business practices which a firm recognizes as crucial for achieving business sustainability (Qiao et al., 2022). This is consistent with Makhloufi et al.'s (2022) finding that a firm can enhance its CA over its competitors by deploying an eco-friendly strategy that connects with consumers' environmental concerns. The moderating effect of GO is examined through the GI and CA linkages. The underlying assumption is that a firm's strong GO manifests itself in the three components of GI practice, which leads to an enhancement of its CA. Conversely, a firm's weak GO shows in its GI practice and serves only as "window dressing" for its public image

(Leelhaphunt & Suntayuth, 2020). It results in stakeholders' doubt and distrust and leads to competitive incapability. The following 3 hypotheses can therefore be developed:

H_{1a}: *A strong GO will moderate a positive linkage between GPDI and CA.*

H_{2a}: *A strong GO will moderate a positive linkage between GPRI and CA.*

H_{3a}: *A strong GO will moderate a positive linkage between GMNI and CA.*

Figure 1 shows the overall conceptual model developed in this study on the basis of the key concepts discussed above.

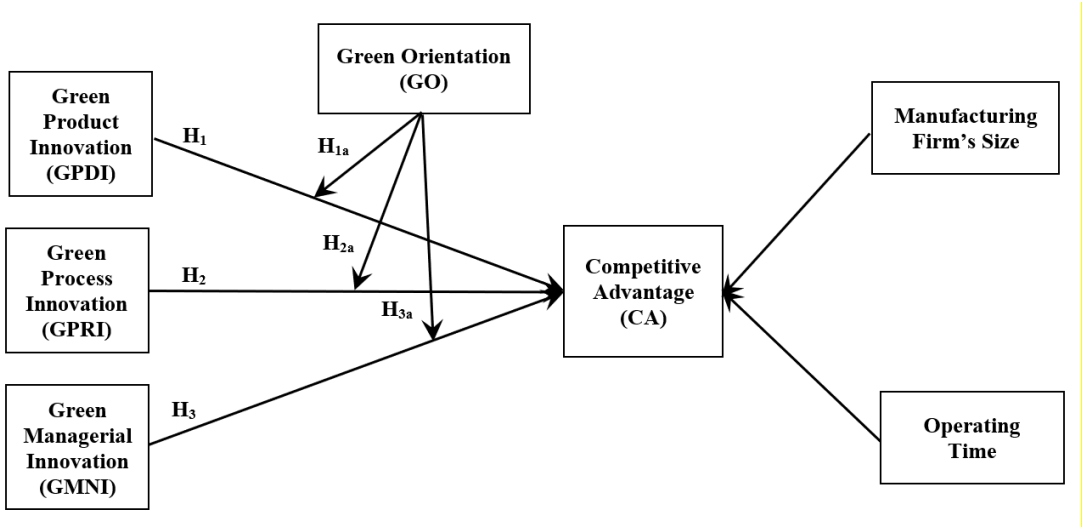

Figure 1: Overall Conceptual Model (created by the author for this study)

3. Research Methodology

- *Sample and Procedures*

As we just saw, as causal research at the organizational level, this quantitative research study explores the direct effect of GPDI, GPRI, GMNI on a firm's CA and the moderating effect of its GO on its CA. To this end, it investigates a number of manufacturing firms located in the 6 regions of Thailand: (i) central; (ii) east; (ii) northeast; (iv) north; (v) south, and (vi) west. The population consists of a total of 70,410 manufacturing firms located in Thailand (Department of Industrial Works, 2020). The sample size was determined by using Taro Yamane's formula with a 95% level of confidence (Yamane, 1973). It came down to 398 firms. Cluster sampling was utilized with an equal sample size rounded up to 67 samples per region, which means the total sample size ended up including 402 firms. For data collection, the author utilized an industrial network as well as formal invitations for academic purposes. After receiving participants' confirmations, online questionnaires were sent to a key person in the manufacturing operation of the company, for instance, the owner, top management, a factory manager, or a procurement manager.

- *Measurements*

Based on the conceptual model discussed above, the study includes five variables and two control variables (firm size and operating time). The 4-item scale of the GDPI, GPRI, and GMNI constructs were adapted from Alreshidi (2016), the 6-item scale of the GO variable from Benerjee spelling (2002), and the 7-item scale of the CA variable from Change spelling (2011). In addition, in order to avoid hesitations in terms of opinions expressed, a 6-point Likert scale questionnaire was used, ranging from 1 (extremely low agreement) to 6 (extremely high agreement).

- Data Analysis

Data analysis was a two-step process: An initial testing was conducted to obtain the participants' general demographics utilizing the statistical software program. It was also conducted to perform construct validity utilizing the confirmatory factor analysis. Second, hypothesis testing was then conducted to examine the direct effect of GPDI, GPRI, GMNI, and the moderating effect of GO. Process Model 1 was employed to investigate these linkages. Of great import here, this entire research procedure was reviewed and approved by the Institutional Review Board of Burapha University on September 6, 2021, under number IRB2-123/2564.

4. Research Results

The initial English questionnaire was modified and developed into a Thai questionnaire and verified by experts in the sector. A pilot test of 40 random samples was then conducted. The Cronbach's alpha of each scale was above 0.70, indicating acceptable reliability. These samples were removed from the final survey. The online questionnaire was collected over 2 months during the period September-October 2021. It achieved 100 percent collection. The demographic characteristics of the participants are shown in Table 1.

Table 1: Characteristics of Respondents

Demographic item		**Frequency**	**Percentage**
Gender	Male	243	60.45
	Female	159	39.55
Age	30-40 years	129	32.09
	41-50 years	176	43.78
	Above 50 years	88	21.89
Level of education	Bachelor's degree	267	66.42
	Master's degree	125	31.09
Current position	Factory/Production manager	177	44.03
	Procurement manager	118	29.35
	R & D Director	4	1.00
	Managing Director/CEO	86	21.39
	Owner	17	4.23
Type of industry	Automotive	58	14.43
	Industrial materials	98	24.38
	Energy/Petrochemical	44	10.95
	Electronic components	92	22.89
	Consumer products	89	22.14
Firm size	SME (≤ 200 employees)	226	56.22
	Large (> 200 employees)	176	43.78
Operating time	Lesser than 5 years	56	13.93
	6-10 years	179	44.53
	11-15 years	106	26.37
Total		402	100.00

60.45 percent of the 402 participants were males and the average age was between 41-50 years old (43.78% of the respondents). 66.42 percent of the participants held a bachelor's degree and 44.03 percent of them were factory/production managers. The rest of them filled the other types of executive positions listed in this study. 24.38 percent of the firms were in the industrial sector and 22.89 percent in the material sector. 56.22 percent of those firms were SMEs and the rest of them large firms. Almost half of them (44.53%) have been in operation for 6 to 10 years.

- *Scales Validation and Reliability*

Obviously, the quality of the questionnaire is crucial to achieving the study objectives. Construct validity was therefore performed, starting with convergent validity. The principal component extraction and varimax rotation techniques used in the factor analysis were applied to this study. The results show that each of the KMO value with a *p*-value of 0.00 ranged above 0.70, indicating that it was proper to utilize the factor analysis technique. An additional analysis indicated that all extraction values were higher than 0.50. As determined by Fornell and Larcker (1981), convergent validity is assessed via the composite reliability (CR) and the average variance extracted (AVE). CR is used to assess reliability and AVE to determine the validity of the measurements. CR values of 0.70 and above are acceptable whereas the acceptable AVE value is 0.50 and above (Hair, 2010). To analyze the CR and AVE, a first-order confirmatory factor analysis (CFA) was conducted. As Table 2 shows, the criteria of convergent validity based on CR and AVE were met. In addition, discriminant validity was tested by utilizing the first-order CFA with the maximum likelihood technique. Based on the analytical framework, the square root of the AVE should surpass its correlation with other constructs. Table 2 shows that the criteria of discriminant validity based on the square root of AVE and the latent variables correlation were met. Thus, construct validity was achieved.

Table 2: Construct Validity Analysis

Variable	Item	CR	AVE	GPDI	GPRI	GMNI	GO	CA
1. GPDI	4	0.79	0.50	0.71[a]				
2. GPRI	4	0.80	0.52	0.30[b]	0.72[a]			
3. GMNI	4	0.81	0.53	0.30[b]	0.33[b]	0.73[a]		
4. GO	6	0.87	0.54	0.31[b]	0.32[b]	0.34[b]	0.74[a]	
5. CA	7	0.90	0.55	0.31[b]	0.33[b]	0.35[b]	0.40[b]	0.74[a]

Note: N = 402, [a] = square root of AVE, [b] = latent variables correlation

- *Hypothesis Testing: GPDI Direct and Indirect Effects*

Based on H_1, the direct positive linkage of GPDI with CA was examined. In the meantime, H_{1a} tested the conditional effect of the GO moderator on this linkage. The underlying assumption of the moderator was that it was either a strong or weak GO. Hayes (2013) recommends using PROCESS model 1 to evaluate the conditional effects of moderation. Thus, both hypotheses were tested separately. Starting with the direct effect of H_1, a multiple regression analysis (MRA) was conducted by entering the dependent, independent, and control variables. Firm size and operating time were treated as ordinal scales. As indicated in Table 3, it was found that GPDI had a significantly positive impact on CA (b = 0.15, $p < 0.01$, adjusted $R^2 = 0.64$). Thus, H_1 was supported. Moreover, being a large firm had a significantly greater positive impact on CA than being a smaller company (b = 0.86, $p < 0.01$) and having been in operation for a long time also had a significantly greater positive impact on CA than having been in operation for a short time (b = 0.41, $p < 0.01$).

Table 3: GDPI Direct and Indirect Effects

Variable	Direct Effect on CA (Y) Adjusted $R^2 = 0.64$, F = 236.31**					Indirect Effect on CA (Y) $R^2 = 0.64$, F = 173.49**		
	b	β	SE	t	VIF	b	SE	t
Constant	1.35		0.14	9.86**		1.98	0.10	20.41**
GPDI (X_1)	0.15	0.15	0.03	4.66**	1.11	0.14	0.04	3.79**
GO (M)						0.10	0.05	1.96*
Interaction (X_1M)						-0.03	0.07	-0.40
Firm size	0.86	0.53	0.05	16.83**	1.08	0.85	0.05	16.64**
Operating time	0.41	0.47	0.03	15.14**	1.04	0.41	0.03	14.26**

Note: N = 402, *$p < 0.05$, **$p < 0.01$

Next, the separated PROCESS model 1 was performed to explore each conditional effect of either a strong or a weak GO. The analysis, presented in Table 4 and Figure 2 shows "Path b_1" from GPDI (X_1) to CA (Y), and a significant result ($b = 0.14$, $p < 0.01$). "Path b_2" was from a GO (M) to CA (Y) and "Path b_3" an interaction term aroused by X_1 x M. The results indicate that "Path b_3" to CA was nonsignificant ($b = -0.03$, $p = 0.69$).

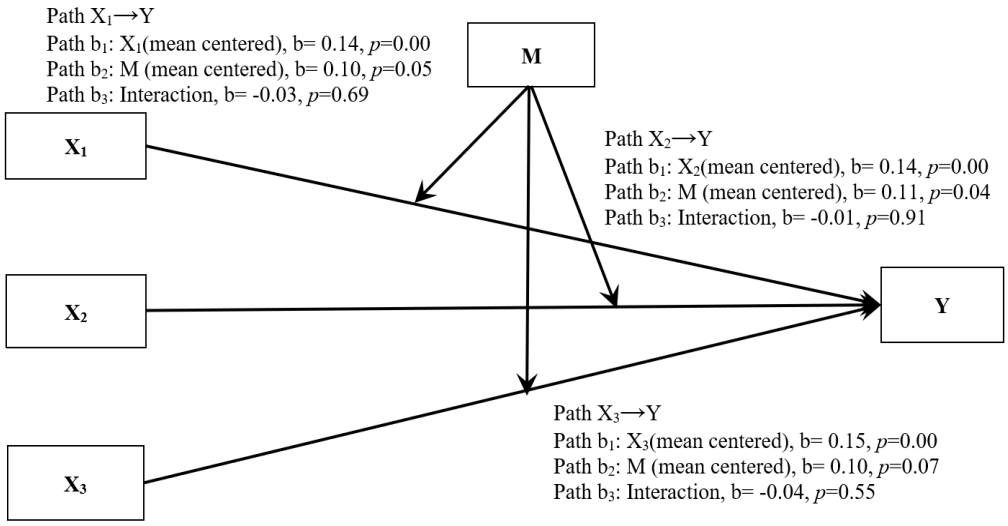

Figure 2: Results of Moderating Effect

For other perspectives, as recommended by Hayes (2013), the 95% bias-corrected bootstrap confidence interval with a 5000-sample was utilized and the evidence of the conditional effect of X on Y at the value of each moderator indicated by "no zero" in the confidence intervals. One of the advantages of a PROCESS analysis is that it shows the results of the conditional effects of both a strong and weak moderator, including the *p*-value and the statistical inference of the confidence intervals. To calculate the conditional effects of X on Y at the value of each moderator, the following equation can be used: $\Theta = b_1+b_3V$

where: Θ = Total conditional effect of M on Y at the value of V
b_1 = Path b_1 from M to Y
b_3V = Interaction term
V = Value of each moderator

Table 4: GO Moderating Effect of GO

Conditional effect of (X) on (Y) at value of each moderator (V): $\Theta = b_1+b_3V$				
GPDI[a] (X_1)	**CA (Y)**			
	Θ	**SE**	**LLCI[b]**	**ULCI[c]**
Strong GO (V = 0.47)	0.12*	0.04	0.04	0.20
Weak GO (V = -0.53)	0.15*	0.06	0.03	0.27
GPRI[a] (X_2)	**CA (Y)**			
	Θ	**SE**	**LLCI[b]**	**ULCI[c]**
Strong GO (V = 0.47)	0.14*	0.06	0.02	0.26
Weak GO (V = -0.53)	0.13**	0.04	0.05	0.21
GMNI[a] (X_3)	**CA (Y)**			
	Θ	**SE**	**LLCI[b]**	**ULCI[c]**
Strong GO (V = 0.47)	0.17**	0.64	0.05	0.30
Weak GO (V = -0.53)	0.13**	0.42	0.05	0.21

Note: N = 402, *$p < 0.05$, **$p < 0.01$
[a] = mean-centered, [b] = a lower level of Bootstrap confidence interval,
[c] = an upper level of Bootstrap confidence interval

Moderating effect of GO on $P_{X1\rightarrow Y}$	**CA (Y)**	
	Strong	**Weak**
Direct effect of X_1 on Y: Path ($P_{X1\rightarrow Y}$) = c′	0.14**	0.14**
Conditional effect of X_1 on Y based on each moderator	0.12*	0.15*
Total effect of X_1 on Y = direct effect + conditional effect of X_1 on Y	0.26	0.29
Moderating effect of GO on $P_{X2\rightarrow Y}$	**CA (Y)**	
	Strong	**Weak**
Direct effect of X_2 on Y through direct path ($P_{X2\rightarrow Y}$) = c′	0.14**	0.14**
Conditional effect of X_2 on Y at the value of moderators	0.14*	0.13**
Total effect of X_2 on Y = direct effect + conditional effect of X_2 on Y	0.28	0.27
Moderating effect of GO on $P_{X3\rightarrow Y}$	**CA (Y)**	
	Strong	**Weak**
Direct effect of X_3 on Y through direct path ($P_{X3\rightarrow Y}$) = c′	0.15**	0.15**
Conditional effect of X_3 on Y at the value of moderators	0.17**	0.13**
Total effect of X_3 on Y = direct effect + conditional effect of X_3 on Y	0.32	0.28

As indicated in Table 4, the conditional effect of X_1 on Y with a strong GO (V = 0.47) had "no zero" presented in the 95% confidence interval (CI [0.04, 0.20]) and had a positive conditional effect ($\Theta = 0.12$, $p < 0.05$). Thus, H_{1a} was supported.

- *Hypothesis Testing: GPRI Direct and Indirect Effects*

Based on H_2 and H_{2a}, the direct and indirect effects of GPRI on CA were examined. Using the method described above, both hypotheses were tested separately. As Table 5 shows, the direct effect of GPRI is that it has a significantly positive impact on CA (b = 0.15, $p < 0.01$, adjusted $R^2 = 0.64$). Thus, H_2 was supported. Moreover, both control variables provided the same results as the test above (firm size: b = 0.86, $p < 0.01$, operating time: b = 0.41, $p < 0.01$).

Table 5: GPRI Direct and Indirect Effects

Variable	**Direct Effect on CA (Y)** Adjusted $R^2 = 0.64$, F = 236.86**					**Indirect Effect on CA (Y)** $R^2 = 0.65$, F = 173.32**		
	b	**β**	**SE**	**t**	**VIF**	**b**	**SE**	**t**
Constant	1.34		0.14	9.82**		1.98	0.10	20.20**
GPRI (X_2)	0.15	0.15	0.03	4.72**	1.11	0.14	0.04	3.67**
GO (M)						0.11	0.05	2.03*
Interaction (X_2M)						-0.01	0.07	-0.11
Firm size	0.86	0.53	0.05	16.80**	1.08	0.84	0.05	16.38**
Operating time	0.41	0.46	0.03	15.08**	1.05	0.41	0.03	14.10**

Note. N = 402, *$p < 0.05$, **$p < 0.01$

The analysis presented in Table 4 and Figure 2 above indicates that the "Path b_1" from X_2 to Y was significant (b = 0.14, p < 0.01) and that the "Path b_2" was from M to Y. The result of "Path b_3" from the interaction term to Y was nonsignificant (b = -0.01). In addition, as indicated in Table 5, the conditional effect of X_2 on Y with a strong GO (V = 0.47) had "no zero" presented in the 95% confidence interval (CI [0.02, 0.26]) and had a positive conditional effect ($\Theta = 0.14$, $p < 0.05$). Thus, H_{2a} was supported.

- *Hypothesis Testing: GMNI Direct and Indirect Effects*

Lastly, based on H_3 and H_{3a}, the direct and indirect effects of GMNI on CA were examined. Using the same above method, both hypotheses were tested separately. Table 6 shows that the direct effect of GMNI is its significantly positive impact on CA (b = 0.16, $p < 0.01$, adjusted $R^2 = 0.64$). Thus, H_3 was supported. Both control variables provided similar results (firm size: b = 0.85, $p < 0.01$, operating time: b = 0.41, $p < 0.01$).

Table 6: GMNI Direct and Indirect Effects

Variable	Direct Effect on CA (Y) Adjusted $R^2 = 0.64$, F = 240.15**					Indirect Effect on CA (Y) R = 0.65, F = 176.07**		
	b	β	SE	t	VIF	b	SE	t
Constant	1.34		0.13	10.09**		2.01	0.10	20.42**
GMNI (X_3)	0.16	0.16	0.03	5.11**	1.14	0.15	0.04	3.92**
GO (M)						0.10	0.05	1.83
Interaction (X_3M)						-0.04	0.07	-0.60
Firm size	0.85	0.52	0.05	16.60**	1.10	0.84	0.05	16.19**
Operating time	0.41	0.46	0.03	14.79**	1.06	0.41	0.03	13.85**

Note. N = 402, *$p < 0.05$, **$p < 0.01$

The results shown in Table 4 and Figure 2 above indicate that "Path b_1" from X_3 to Y was significant (b = 0.15, p < 0.01) and that Path b_2" was from M to Y. However, Path b_3" from the interaction term to Y was nonsignificant (b = -0.04). In addition, as Table 6 shows, the conditional effect of X_3 on Y at strong GO (V = 0.47) had "no zero" presented in the 95% confidence interval (CI [0.05, 0.30]), and a positive conditional effect (Θ = 0.17, $p < 0.01$). Thus, H_{3a} was supported.

5. Discussion and Conclusion

Although numerous studies have examined the linkage between GI and CA (Gurlek, & Tuna, 2018; Li et al., 2021), none of them has focused on the conditional effect of the three GI components (GPDI, GPRI, and GMNI). Another distinctive feature of this study is that its author used the theoretical framework of the strategic choice theory to explain how an executive chooses GI to enhance the CA of its company. In addition, the findings in this study show how an executive's choice of either a strong or a weak GO reinforces the 3 components of GI in response to a certain level of CA of the company. Beginning with H_1, the results show that GPDI has a positive correlation with CA. This is consistent with previous studies in which it was determined that CA can be enhanced by GPDI (Chouaibi & Chouaibi, 2021; Jianhong et al., 2020; Xie et al., 2019). Taking into account the conditional effect of H_{1a}, the results indicate that the interaction of GPDI and a strong GO has a positive linkage with CA. However, a further analysis of both a strong and weak GO reveal that a weak GO has a higher positive effect on a firm's CA than a strong GO does. This is counter intuitive and implies that an executive is often more concerned with the variable cost of raw materials than with a green approach to the management of the firm as, in general, eco-friendly raw materials are more expensive. To survive in a highly competitive business, a firm will often seek short-term gains, even if this means facing business unsustainability on the long term or, to put it another way, not prioritizing a green orientation. One of the consequences of such a choice is that following the route of unsustainability may negatively affect the corporate image of a firm and caused it to lose a business opportunity in the form of a positive image. As consumers are becoming more sensitive to climate change and its effects on their environment, this may be a source of concerns to executives. Next, based on H_2, the result indicates that GPRI has a direct positive linkage with CA. This is in keeping with recent studies concluding that a firm could gain more

CA by promoting GPRI (Rehman et al., 2021; Saudi et al., 2019; Wang et al., 2020). As to H_{2a} prediction, it was found that the interaction of GPRI and a strong GO has a positive linkage with CA. Moreover, while both a strong and weak GO generates a positive effect on CA, a higher level of GO has a greater effect on the firm's CA. The implication is that adopting either a strong or a weak GO reinforces the firm's GPRI could generate a higher CA. For example, in their recent study, Rehman et al. (2021) found that manufacturing firms focused on the avoidance of hazardous waste from an existing process to minimize any treatment expenses, eventually enjoyed a stronger CA. Lastly, regarding H_3, it was found that GMNI has a direct positive linkage with CA. This is in line with previous studies, in which it was determined that a firm's CA can be achieved by implementing GMNI (Almeda et al., 2020; Begum et al., 2020; Yacob, Wong, & Khor, 2019). Taking H_{3a} into account, the results indicate that the combination of GMNI with a strong GO has a positive linkage with CA. While a further analysis shows that both a strong and a weak GO have positive effect on CA, it also indicates that a stronger degree of green orientation will a much greater effect and a weak one. Opting for a strong firm GO should thus be a key component of an executive's leadership as it will provide the organization with a higher competitive advantage.

These findings make it abundantly clear that, as expounded by the strategic choice theory, the stance taken by a firm's executive in terms of environmental issues can have a profound impact on the firm's CA. All that said, while a strong proactive green strategy and practice will enhance the CA and business sustainability of the organization – and substantially limit the risk of a negative image, any degree of GO (either strong or weak) will have a positive effect on its CA. By implication, these findings also make it abundantly clear that no GO can be highly detrimental to a firm's CA, and among other consequences, seriously damage its reputation, generally regarded as one of the main assets of a firm (Chung, 2020; Sun & Sun, 2021).

- *Managerial Contribution*

Based on the above discussion, executives have several options in terms of a firm's green orientation. They may either together or separately:

1. Adopt a strong GO and reenforce the firm's GPDI in order to minimize unforeseen business risk and enjoy a real CA.
2. Not hesitate to implement a strong GO on GPRI as an essential corporate strategy since securing sustainability and a robust CA requires heavy investment in eco-manufacturing process.
3. Only opt for a strong GO in order to secure a greater effect on the firm's CA since managerial expenses play a major part in administration costs. Thus, an executive should provide a strong proactive green practice to enhance CA and business sustainability.

- *Theoretical Contribution*

As explained earlier, the strategic choice theory is based on the fundamentals at the root of the classic contingency theory, which provides the rationale for adopting proactive strategies to address critical business issues and ensure environmental sustainability. Given his/her proactive role, an executive's strategic choice can result in high organizational efficiency and a strong performance. As applied to this study, one of the implications of this theory is that the proactive response of a firm's executive leads to a high level of commitment to green initiatives in order to enhance the company's competitive advantage and environmental sustainability. The findings of this study can therefore add to the body of literature on green innovation strategies capable of enhancing CA. They can also reaffirm the validity of the strategic choice theory.

- *Limitations of this Study and Future Research*

Notwithstanding the above, this study has two main limitations. The first is the timing of the research and its costs as data collection was conducted during the COVID-19 pandemic, which caused many manufacturers to temporary halt their operations. Second, the manufacturing firms surveyed in this study operate in very different business environments, they are not similarly situated in terms of environmental concerns and have different degrees of green business practices. Besides, their capital or management orientations may contribute unequally to their green orientation. These two limitations limit the generalizability of this study's results. Future research on the issues tackled in this study should therefore be conducted post-Covid-19 when manufacturers fully resume their operations. Furthermore, it should concentrate on different types and a wider range of industries, thereby making a generalization of Thailand's industrial context.

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