

Uncertain Supply Chain Management

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The effect of green supply chain management practices on performances of herb manufacturers in Thailand

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ABSTRACT

Article history:

Received May 18, 2023

Received in revised format July 29, 2023

Accepted September 12 2023

Available online

September 12 2023

Keywords:

Green Supply Chain Management

Herb Manufacturers

Environmental Performance

Operational Performance

Organizational Performance

This research aimed to 1) investigate the levels of green supply chain management practices (GSCMP), environmental performance (ENP), operational performance (OPP), and organizational performance (ORP) in the context of Thai herb producers; and 2) investigate the interactions between GSCMP, ENP, OPP, and ORP. Quantitative research methodologies were applied in the research. The sample for the quantitative study consisted of 340 Thai herb producers selected by stratified sampling by region. The instruments employed for research were questionnaires. Statistics such as frequency, percentage, mean, standard deviation, confirmatory factor analysis, and structural equation modeling were utilized for quantitative data analysis. Results indicated that GSCMP, ENP, OPP, and ORP levels were high. In addition, GSCMP had direct positive effects on ENP and OPP, as well as indirect positive effects on OPP and ORP, respectively, mediated via ENP and OPP. In addition, ENP had a favorable direct impact on OPP and a positive indirect impact on ORP, with OPP serving as a mediator. Herb producers might use these insights as a roadmap to enhance their organizational performance. In addition, government agencies may utilize the study's findings to establish a strategy for assisting entrepreneurs. In addition, academics and interested parties might bring the research findings to examine and perform more research.

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1. Introduction

Today, the worldwide herbal industry is worth more than \$100 billion. As customers try to take ongoing care of their health and appearance, there is a high demand for natural goods and herbs. This includes its appeal as hormone replacement and neurological care options with cheaper treatment costs and more safety than current medicine. Germany, Japan, and France are the nations with the highest market value of the herb. In addition, the herb market in emerging nations has a rising rate of consumption due to the increasing recognition of the significance of herbal and traditional medicine. The herb and traditional medicine market in the Asia-Pacific area will have the highest growth rate of all herb markets. Especially in Thailand, it depicts the growth rate of consumption of herbal products in the country by approximately 10 percent (The Thai Chamber of Commerce, 2021; Pintuma et al., 2020; Golpîra et al., 2017). As a result, factors enhancing the performances of herb manufacturers need to be studied. Green supply chain management is of importance to the public and business sectors of many nations, including Thailand, its trade partners, and its economic rivals. This is seen in the use of green supply chain management practices (GSCMP) to improve the environmental, operational, and organizational performance of businesses in

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ISSN 2291-6830 (Online) - ISSN 2291-6822 (Print)

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doi: 10.5267/j.uscm.2023.9.010

the present day. When examining how to promote and push green logistics and supply chain management at the macro level, it was discovered that nations have a variety of promotion and pushing strategies and methods (Department of Primary Industries and Mines, 2020). This demonstrates that Thai business owners, specifically herb manufacturers, need to pay attention to green supply chain management and support government environmental policies to meet the needs of current users and compete with foreign competitors. This is necessary so that herb manufacturers in Thailand can survive the COVID-19 outbreak, which has negatively impacted the growth of global and Thailand manufacturing businesses (Aunyawong et al., 2021), and can continue both operating and expanding their businesses (Department of Business Development, 2021; Singhry & Rahman, 2018).

The facts shown above demonstrate that Thailand's herb sector is vital to the country's economy. However, the firm must change to survive the strong competition of today. Previous research has shown that green supply chain management has a significant impact on a company's operational success (Choudhary & Sangwan, 2019; Younis & Sundarakani, 2019; Acquah, Agyabeng-Mensah, & Afum, 2020) and environmental performance (Choudhary and Sangwan, 2019; Acquah, Agyabeng-Mensah, & Afum, 2020; Huang, Borazon, & Liu, 2021), which will lead to organizational performance (Rajaguru & Matanda, 2019; Zhai & Tian, 2019; Ullah, Iqbal, & Shams, 2020). Therefore, the purpose of this study is to evaluate green supply chain management solutions that may improve the environmental, operational, and organizational performance of Thailand herb producers and to provide ideas for enhancing their organizational performance. The study's results suggest that efficient corporate management is centered on environmental preservation at all stages and activities within the supply chain, which will assist businesses in gaining profits and market share by creating a favorable image and environmental performance. The findings may potentially generate a competitive advantage in Thailand's herb sector and other businesses with comparable characteristics.

2. Literature review

2.1 Green Supply Chain Management Practices

The term “green supply chain management practices” (GSCMP) refers to procedures that integrate environmental management and supply chain management principles from the design stage through manufacture, packaging, storage, distribution, and disposal of products (Martínez & Mathiyazhagan, 2020). All processes must emphasize integrating green supply chains across suppliers, internal departments, and customers to enhance value to efficient operations, acquire a competitive edge, and minimize the business's environmental effect sustainably (Green et al., 2012; Tran et al., 2020). Internal environmental management, green buying, customer interaction, and eco-design are crucial elements of commercial business GSCMP, according to Teixeira et al. (2016), Namagembe (2019), Cousins et al. (2019), and Prachayapipat et al. (2019). (2020). Companies utilizing GSCMP in processes of design, manufacturing, distribution, and logistics management will achieve greater operational performance than those that do not (Choudhary & Sangwan, 2019). Management of the company's internal environment that is standardized and accredited by government environmental authorities is a strategic objective based on consumer demands (Younis & Sundarakani, 2019). In addition, GSCMP may influence activities in the marketing, financial, social, economic, and environmental domains (Acquah, Agyabeng-Mensah, & Afum, 2020). It is, thus, hypothesized that:

H₁: *Green supply chain management practices have a positive direct effect on operational performance.*

GSCMP will assist in promoting a favorable image of the firm to society (Choudhary & Sangwan, 2019) and fostering the growth of environmental operations (Acquah et al., 2020). Moreover, the current research showed that GSCMP driven by stakeholder demands and corporate green resources has a considerable beneficial influence on the environmental and economic performances of the business (Huang et al., 2021). It is, therefore, hypothesized that:

H₂: *Green supply chain management practices have a positive effect on environmental performance.*

2.2 Environmental Performance

Environmental performance (ENP) is the capacity of an organization to guarantee that the community in which it operates has a good quality of life, for example, by avoiding pollution problems that endanger the health and welfare of its constituents (Younis et al., 2016). ENP, then, refers to the results of a business in determining the scope and direction of resource control in environmental systems to sustainably contribute to society, as well as the impact on the environment and external communities by limiting or preventing pollution (O'Donohue & Torugsa, 2016). Griffin et al. (2017), Tan et al. (2017), Acar and Temiz (2019), and Tadros et al. (2020) claim that ENP includes Product Innovation, Resource Reduction, and Emission Reduction (PI). Environmental innovation strategies, such as reducing greenhouse gas emissions and energy or fuel consumption, will result in effective operational performance (Gomez-Conde et al., 2019), enabling businesses to grow and compete in the marketplace (Taghizadeh et al., 2020). Furthermore, identifying strategic environmental goals not only drives environmentally responsible product design, but also plays a critical role in improving environmental and operational performance (Yang et al., 2020). It is, consequently, hypothesized that:

H₃: *Environmental performance has a positive effect on operational performance.*

2.3 Operational Performance

Operational Performance (OPP) is the capacity of a company to minimize costs or expenses in managing operations in accordance with the time of the order cycle, enhance raw material usage efficiency, and satisfy customer delivery criteria (Nawaniret et al., 2013; Ataseven et al., 2005). OPP evaluation is critical for producers since it helps the manufacturing of high-quality items. This increases customer satisfaction, revenue, and profitability (Jabbour et al., 2013). Moreover, OPP indicators are indirectly assessed by the turnover rate or absenteeism rate, which is a consequence of the effectiveness of human resource management (Truong et al., 2014). According to a review of prior research by Abdallah et al. (2016), the most critical OPP aspects of a business organization are Cost (CO), Quality (QUAL), and Delivery Time (DT). Rajaguru and Matanda (2019) state that resource integration between supply chain partners assists organizations in achieving supply chain capabilities and competitive corporate performance, whereas Zhai and Tian (2019) discovered that an efficient operating system had a greater impact on business performance in developing countries than in developed nations. In addition, Iqbal and Shams (2020) demonstrated that the implementation of customer-centered operational management had a substantial beneficial effect on organizational performance, resulting in increased customer satisfaction. It is, as a result, hypothesized that:

H₄: *Operational performance has a positive effect on organizational performance.*

2.4 Organizational Performance

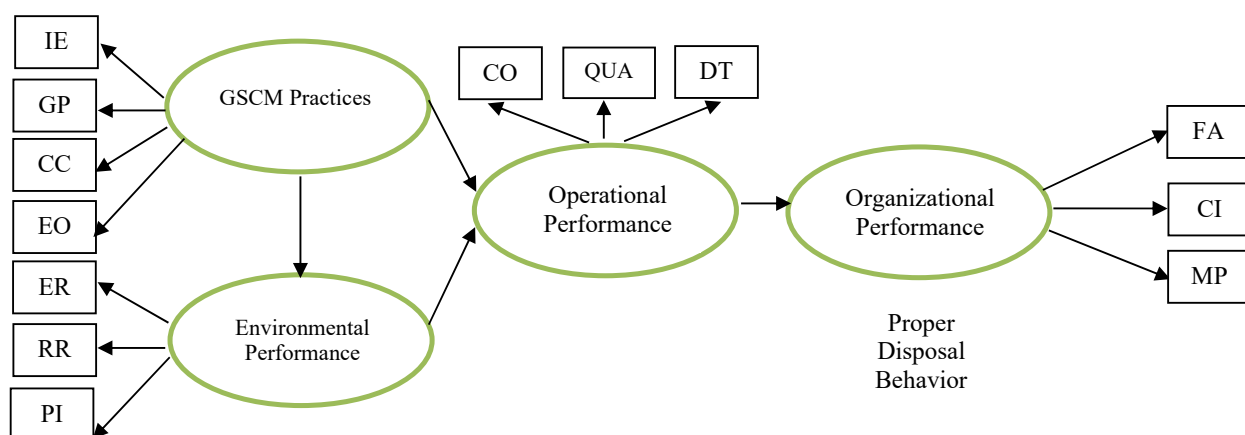
Wu et al. (2015) defined organizational performance (ORP) as a success indicator made up of productivity, profit, service quality, and client and staff satisfaction. To boost employee engagement, indicators of ORP also include employee safety, appropriate rewards, fair compensation, a suitable working environment, and the quality of work life (Al Issa, 2020). Based on the theories of Kurniawan et al. (2020) and Ilmudeen et al. (2019), ORP is divided into three categories: financial accomplishment (FA), customer intimacy (CI), and marketing performance (MP) (2019).

The link between variables based on the foregoing assumptions, as shown in Fig. 1, enables this research to investigate the mediating impacts of operational performance and environmental performance, as suggested by Hayes (2017), Phrapratanporn et al. (2019), and Aunyawong et al. (2020). It is, accordingly, hypothesized that:

H₅: *Operational performance positively mediates the effect of green supply chain management practices on organizational performance.*

H₆: *Operational performance positively mediates the effect of environmental performance on organizational performance.*

H₇: *Environmental performance positively mediates the effect of green supply chain management practices on operational performance.*



Note: IEM: Internal environmental management; GP: Green Purchasing; CC: Cooperation with Customers; ED: Eco-Design; ER: Emission Reduction; RR: Resource Reduction; PI: Product Innovation; CO: Cost; QUA: Quality; DT: Delivery Time; FA: Financial Achievement; CI: Customer Intimacy; MP: Marketing Performance

Fig.1. Conceptual framework

3. Research methodology

In Thailand, there are 301 herb manufacturers (Department of Business Development, 2021). The sample consisted of 260 Thailand herb growers, as established by the sample size criterion for statistical analysis of the Structural Equation Modeling (SEM) needing at least 20 times the observed variables in the model (Hair et al., 2010). The 13 observable variables were derived from the conceptual framework of the study. Therefore, a sample size of at least 260 (13×20) samples was necessary. The sample was stratified according to region. A questionnaire and an interview form were used to gather data for research purposes. Validity and dependability of the instrument's precision were assessed. The validity comprised of content validity with IOC >0.5 and construct validity with confirmatory factor analysis (CFA), and the reliability was determined by Cronbach's alpha >0.8 (Cronbach, 1990). As described in the literature study, the five-point Likert scale questionnaire included questions linked to research variables and based on the ideas of previous studies. For the interpretation of quantitative data, the criteria given by Best and Kahn (2006) were employed.

For identifying the normal distribution of data in the SEM study, descriptive statistics comprising mean, standard deviation (S.D.), skewness (Sk), and kurtosis (Ku) were employed for data analysis. In addition, the AVE of the latent variable must be greater than the squared correlation between the latent variable and all other variables. In addition, convergent validity was evaluated by ensuring the composite reliability value was more than 0.70 and the AVE was greater than 0.50 (Fornell & Larcker, 1981). Thirdly, the construct validity of the questionnaire was evaluated using CFA. Fourthly, route analysis was performed to test the hypotheses of the study. Fifth, model fit indicators and the requirements of C.R. or t-value >1.96 were based on Diamantopoulos and Siguaw's hypothesis proposal (2000).

4. Research results

4.1 Testing Results of Measurement Model

Considering skewness with values between -3 and +3 and kurtosis of 8, suggesting a normal distribution, the findings indicated that the observed variables averaged between 4.11 and 4.44, which was a high level, and had a standard deviation between 0.53 and 0.72. (Kline, 2005). All variable factor loadings were positive and statistically distinct from zero at the 0.001 level. The variable with the highest factor loading was marketing performance (MP) with a factor loading of .929. The variable with the lowest factor loading was customer cooperation (CC) with a factor loading of .702. Moreover, R² ranged from .601 to .867, as seen in Table 1.

Table 1
Testing Results of Measurement Model

Variable	\bar{x}	S.D.	Remark	Sk	Ku	b	β	S.E.	T	R ²
GSCMP	4.32	.09	High	-	-	-	-	-	-	-
IEM	4.29	.64	High	-.875	1.496	.911	.815	.047	18.783***	.661
GP	4.22	.64	High	-.884	1.254	1.000	.882	<- ->	<- ->	.775
CC	4.44	.55	High	-.912	.398	.659	.702	.046	14.523***	.687
ED	4.31	.59	High	-.646	.431	.786	.764	.050	15.572***	.665
ENP	4.17	.08	High	-	-	-	-	-	-	-
ER	4.26	.53	High	-.405	.435	.745	.874	.038	19.733***	.763
RR	4.13	.68	High	-1.157	2.623	.926	.833	.039	23.226***	.697
PI	4.12	.72	High	-.961	1.258	1.000	.857	<- ->	<- ->	.733
OPP	4.21	.01	High	-	-	-	-	-	-	-
CO	4.21	.66	High	-.751	.562	.975	.752	.059	16.107***	.667
QUA	4.20	.57	High	-.535	.273	.816	.710	.051	16.578***	.601
DT	4.22	.60	High	-.834	.746	1.000	.841	<- ->	<- ->	.702
ORP	4.15	.11	High	-	-	-	-	-	-	-
FA	4.21	.60	High	-.403	.657	.970	.875	.043	21.525***	.769
CI	4.11	.63	High	-.442	.476	.943	.857	.045	22.867***	.730
MP	4.13	.60	High	-.575	.723	1.000	.929	<- ->	<- ->	.867

4.2 Path Analysis Results

H1-H7 were accepted with statistical significance at the 0.001 level, showing that GSCMP had a favorable direct effect on OPP, with an effect size of .652; GSCMP had a favorable direct effect on ENP, with an effect size of .858; ENP had a favorable direct effect on OPP, with an effect size of .351; OPP had a favorable direct effect on ORP, with an effect size of .913; and ENP had a favorable direct effect. As shown in Fig. 2 and Table 2, GSCMP successfully predicted ENP by 80.1 percent, OPP by 90.3 percent, and ORP by 90 percent when combined with ENP and OPP.

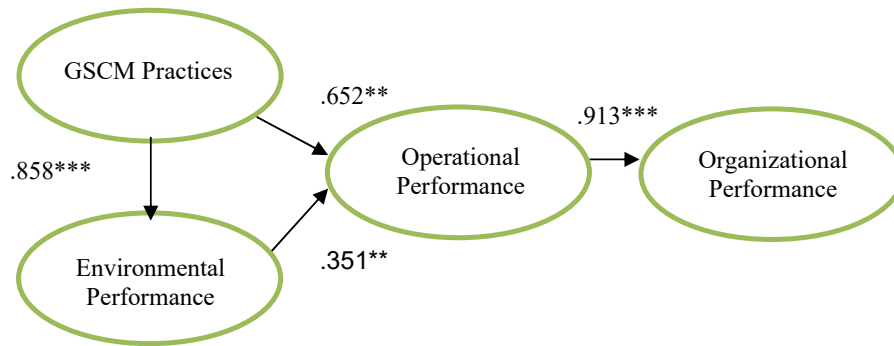


Fig. 2. Path analysis results

Table 2

Path analysis results

H	Independent Variable	Mediating Variable	Dependent Variable	B	p-value	S.E.	t-value (C.R.)	R ²
H ₁	GSCMP	-	OPP	.652	.000	.075	6.258	.801
H ₂	GSCMP	-	ENP	.858	.000	.065	5.367	.903
H ₃	ENP	-	OPP	.351	.000	.078	4.556	.903
H ₄	OPP	-	ORP	.913	.000	.052	10.523	.900
H ₅	GSCMP	ENP	OPP	.301	.000	-	-	.903
H ₆	GSCMP	OPP	ORP	.595	.000	-	-	.900
H ₇	ENP	OPP	OPP	.320	.000	-	-	.900

Note: Threshold of acceptable hypothesis: t-value > 1.96

5. Discussion and Conclusion

Green supply chain management techniques, environmental performance, operational performance, and organizational performance are at a high level among Thailand's herb producers, consistent with the research of Ilmudeen et al. (2019); Prachayapipat et al. (2022); and Tadros et al. (2020). This demonstrates that most Thailand's manufacturers now work with consumers on environmental design, clean services, ecologically friendly packaging, and energy conservation during delivery, which is consistent with previous Thailand-specific research (Nualkaw, 2021; Setthachotsombut & Aunyawong, 2020).

In agreement with Choudhary and Sangwan (2019), Younis and Sundarakani (2019), Acquah et al. (2020), Huang et al. (2021), Gomez-Conde et al. (2019), Taghizadeh et al. (2020), and Yang et al. (2019), environmental performance has a direct beneficial impact on operational performance (2020). According to Rajaguru and Matanda (2019), Zhai and Tian (2019), and Ullah et al. (2019), operational performance has a favorable direct influence on organizational performance (2020), in accordance with Hayes (2017), Phrapratanporn et al. (2019), and Aunyawong et al. (2020).

These results may serve as guidance for herb producers seeking to enhance their organizational performance. Entrepreneurs should embrace environmentally responsible supply chain management strategies and concentrate on enhancing environmental and operational performance. In addition, government organizations may use study findings to establish policies aimed at assisting businesses. In addition, academics and interested parties may utilize the research findings to do more research on green supply chain management as well as creative and technology elements that impact the operation of corporate organizations (Sinthukhammoon et al., 2021; Tirastittam et al., 2020, Waiyawuththanapoom, 2020; Wisedsin, 2020).

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