Environmental Management Control Tools for Promoting Sustainable Consumption and Production in Thai and Vietnamese Companies

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Abstract

Sustainable consumption and production (SCP), as one of the sustainable development goals (SDGs) (Goal 12), plays an essential role in promoting environmentally conscious management practices. There are many environmental management tools that can affect the implementation of SCP and related environmental performance, such as environmental management systems, environmental management accounting (EMA), supply chain management and the use of environmental indicators. In addition, environmental management control systems (EMCS), a new concept, may also be useful because it is more comprehensive. In developing countries, identifying any of these tools as useful could promote SCP policy.

This study aimed to analyse how individual environmental management control tools promoted Thai and Vietnamese companies' SCP activities through multiple group structural equation modeling (MGSEM), based on our questionnaire survey data. The impact of SCP activities on environmental performance was also examined. Our results verify that it is appropriate to promote the adoption of SCP policy in companies in developing countries. Furthermore, when promoting SCP policy in developing countries, it is necessary to recognise that the effects of environmental management tools are not always uniform. Traditional management tools may work against new challenges, such as the implementation of SCP, so a more diverse menu of environmental management tools, including EMA, is required.

Key words: environmental management control systems, sustainable consumption and production, Thailand, Vietnam

1. Introduction

In 2015, the 2030 Agenda for Sustainable Development embraced a new set of sustainable development goals (SDGs) to transform the world over the next 15 years (United Nations, 2015). These goals are valid not only for developed countries but also for developing countries. Sustainable consumption and production (SCP), as one of the SDG goals (Goal 12), plays an essential role in promoting environmentally conscious management practices. On account of different economic conditions and socio-cultural factors, SCP requires a diverse focus in developed and developing economies (Wang et al., 2019).

There are many environmental management tools that can affect the implementation of SCP and related environmental performance, such as environmental management systems, environmental management accounting (EMA), eco-design, supply chain management and the use of environmental indicators. In addition to these tools, environmental management control systems (EMCS), as a package, could also be useful because they are more comprehensive. The EMCS concept started from that of management control systems (MCS). Malmi and Brown (2008), advocate an MCS package as a collection or set of relatively independent management control tools to maintain or alter patterns in organizational activities (Henri, 2006). One of the most frequently used MCS frameworks is Merchant and Van der Stedes' (2017) "object of control." The mechanism of EMCS as a form of MCS is designed to guide desirable organizational activities, especially in their environmental aspects (Nishitani et al., 2021). As the concept of EMCS is still under nascent development, a consensus on its definition, conceptualization and operationalization remains absent and fragmented. Thus, in this paper, we define EMCS as a package based on the work of Merchant and Van der Stede (2017) that includes four important categories of environmental management control tools covering control over action (behaviour), results (outcomes), cultural factors and personnel. These topics have been investigated in the context of developed countries (Guenther et al., 2016) but not in developing countries. Identifying any of these tools or means of control as useful could promote SCP policy in developing countries.

Even though the number of studies analysing the relationship between EMCS and environmental performance is limited (Guenther et al., 2016; Nishitani et al., 2021), we have already examined the effectiveness of EMCS as a package for improving environmental performance in our previous studies in Thai and Vietnamese companies (Kokubu et al., 2019; Wu et al., 2021; Nishitani et al., 2021). However, if developing countries need to promote SCP policy for companies, it would be desirable to identify the individual tools or means of control that can contribute to the results. Therefore, in this study, we aimed to analyse how individual environmental management control tools impact the promotion of SCP activities in Thai and Vietnamese companies based on our questionnaire survey data. SCP activities' impact on environmental performance was also examined.

The remainder of this paper proceeds as follows. In Chapter 2, we introduce the source of the data used in the analysis and provide our analytical method. In Chapter 3, we present the results of multiple group structural equation modeling (MGSEM) and discuss factors related to EMCS. Finally, we provide concluding remarks and propose policy recommendations.

2. Data and Analytical Methods

2.1 Data

We designed a questionnaire, based on Guenther et al. (2016), to identify the major elements of EMCS and other environmental management tools.

The questionnaire survey was conducted in Thailand from October to December 2017 and in Vietnam from October to December 2018. The Thai stock market is broadly divided into the MAI market (a market for small and medium-sized enterprises, with an emphasis on future growth potential) and the SET market (a market for large enterprises). The questionnaire survey targeted 596 companies, excluding the financial sector. Of these, 130 companies were from the MAI market and 466 companies were from the SET market. The questionnaire had a valid response rate of 16.95% (SET: 78 companies; MAI: 23 companies). In Vietnam, we conducted the same questionnaire survey of 700 listed and unlisted companies, excluding the financial sector. Vietnam has three main stock markets: the Ho Chi Minh Stock Exchange (HOSE), the Hanoi Stock Exchange (HNX) and a market for unlisted public companies (UPCoM). Ultimately, 205 companies participated in the survey and the valid response rate was 27.14% (HNX: 34 companies; HOSE: 45 companies; UPCoM: 111 companies).

Guenther et al. (2016) point out that the systems of firms can distinguish between operating systems and management systems. In considering the continuum between these two systems, three different categories of environmental management can be classified: (1) the EMA approach, (2) EMCS, and (3) environmental management systems (EMS).

The EMA approach refers to the management of monetary, physical and qualitative information on the environmental impacts and financial consequences of environmentally relevant business activities—information that supports internal and external decision-making, reporting and accountability (Schaltegger et al., 2003). For example, environmental costing, material flow cost accounting and life cycle assessment for environmental issues are accounting-based instruments that have been suggested as loading the "EMA" factor in Table 1. Other means of control by the EMA approach are also assumed to include eco-product-related costing (Eco-products) and the use of environmental indicators (UEI).

The EMCS concept differentiates among action controls (e.g., monitoring activities and processes), results controls (focusing on the outcomes of employee behaviour), cultural controls (e.g., corporate culture and the incentive system) and personnel controls (e.g., employee selection and training) (Guenther et al., 2016). Action controls hold employees accountable for their actions, prescribe desired actions and reduce personal limitations. Results controls capture the classical cybernetic use of environmental performance measures via target-setting, collection of actual figures and measurement of the impact on incentives. Cultural controls capture and use a company's value, norms and degree of compliance. Personnel controls measure employee selection, training and promotion, which are important means of control for matching job requirements with applicants' skills.

EMS is defined as part of an organization's management system, used to develop and implement its environmental policies and manage its environmental aspects under ISO 14001 (ISO, 2004). At this time, EMS is considered to include two means of control: environmental decision making (EDM) and supply chain management (Suppliers). EDM captures the management of environmental aspects and the fulfilment of compliance obligations, while addressing risks and opportunities. Supply chain management consists mainly of environmental measures shared with suppliers.

In summary, "EMA," "Eco-products," "UEI," "Action controls," "Results controls," "Cultural controls,"

Table 1 Measurement constructs of environmental management control tools.

Focus	Categories of environmental management	Environmental management control tools (9 factors)
Operational level	Environmental management accounting	◦ environmental management accounting (EMA) ◦ the eco products-related costing (Eco-products) ◦ the use of environmental indicators (UEI)
	Environmental management control system	◦ Action controls ◦ Results controls ◦ Cultural controls ◦ Personnel controls
Strategic level	Environmental management system	◦ Environmental decision making (EDM) ◦ Supply chain management (Suppliers)

"Personnel controls," "EDM" and "suppliers" as mentioned above are included as nine separate environmental management control tools (factors) in the analytical model. The framework of the questionnaire was designed from these nine factors (see Table 1). The specific questions included for each factor were mainly cited from the following eight empirical studies: Ferreira et al. (2010), Goebel and Weissenberger (2017), Henri and Journeault (2010), Journeault (2016), Journeault et al. (2016), Perego and Hartmann (2009), Pondeville et al. (2013) and Widener (2007) on a five-point Likert scale (see Table 2).

Regarding the measurement of SCP, to represent the SCP variable, the questionnaire asked about the status of SCP, i.e., whether the company had incorporated or was planning to incorporate sustainable consumption and production into its business activity targets (1: yes, 2: no). We employed companies' self-evaluation on waste reduction as their environmental-performance-related SCP.

2.2 Analytical Methods

The analysis conducted in this study consisted of the following two steps.

In Step 1 we tested whether our data replicated the elements from EMCS and other environmental management tools. We then conducted exploratory factor analysis (EFA) to assess the elements of EMCS.

In Step 2, to investigate whether the elements of the EMCS and other environmental management tools verified in Step 1 could support the implementation of SCP and improve environmental performance, we employed MGSEM. Structural equation modeling (SEM) is a powerful statistical technique that combines a measurement model, or confirmatory factor analysis, and a structural model into a simultaneous statistical test (Hoe, 2008). It is particularly valuable in inferential data analysis and hypothesis testing where the pattern of inter-relationships among the study constructs are specified a priori and grounded in established theory. It has the flexibility to model relationships among multiple predictor and criterion variables, and statistically tests a priori theoretical assumptions against empirical data through CFA (Chin, 1998). In most cases, SEM is applied to the testing of causal relationships among variables (Hoe, 2008). It is also possible to estimate and compare models that come from two or more samples, called MGSEM (Sörbom, 1974). To compare Thai and Vietnamese companies, MGSEM was performed to examine the differences between the countries' models using AMOS (Ver. 27.0).

3. Results and Discussion

3.1 EFA Results

EFA (principal components with promax rotation) was performed on the questionnaire items. Hair et al. (1995) assumed the following multiple extraction rules with an eigenvalue ≥ 1.0, Kaiser-Meyer-Olkin (KMO) index > 0.5 (Cerny & Kaiser, 1977), and communality > 0.5 to determine factor extraction. The eigenvalue measures how much of the variance of the observed variables a factor explains. The value ≥1.0 explains more variance than a single observed variable. The KMO index ranges from 0 to 1, with 0.5 considered suitable for factor analysis. The communality is a definition of common variance that ranges between 0 and 1. Values closer to 1 suggest that the extracted factors explain more of the variance of an individual item. The acceptance of each item was decided based on a factor loading of 0.5 or more and a difference in cross-loadings of greater than 0.2 (Kaiser & Rice, 1974). As a result, eight factors were successfully extracted. Table 2 presents the final descriptive statistics for each item.

3.2 MGSEM Results

To clarify the impact of each EMCS element on SCP and the impact of SCP on environmental performance, MGSEM was performed with SCP and waste reduction as the dependent variable. The independent variables were the individual EMCS elements, Action controls, Results controls, Cultural controls, Personnel controls, EMA, supplier, EDM and UEI. The results are shown in Fig. 1. The model's fitting showed a sufficient value ($\chi^2 = 1.758$, $p < 0.001$, df = 1362, CFI = 0.928, RMSEA = 0.040).

Towards the implementation of SCP in Thailand, action controls are negatively significant and result controls are positively significant. There are no significant EMCA elements in Vietnam. Regarding the other elements, only EMA is significantly positive for SCP in

Table 2 EFA Results.

Items		Vietnam					Thailand				
		Min.	Max.	Mean	SD	λ	Min.	Max.	Mean	SD	λ
Action controls											
Q1	Superiors monitor and evaluate necessary steps regarding their subordinates' achievement of environmental performance goals.	1	5	4.19	0.911	0.783	1	5	3.88	0.963	0.724
Q2	Superiors define the most important work steps for routine environmental tasks.	1	5	4.17	0.883	0.791	1	5	3.88	0.900	0.846
Q3	Superiors provide subordinates with information on the most important steps regarding the achievement of environmental performance goals.	1	5	4.15	0.890	0.700	1	5	3.71	0.919	0.883
Q4	Policies and procedures manuals define the fundamental course of environmental activities.	1	5	4.10	0.959	0.779	1	5	3.98	1.029	0.624
Q5	Subordinates discuss the necessary work steps for achieving the environmental targets with superiors	1	5	4.17	0.911	0.891	1	5	3.95	0.932	0.612
Results controls											
Q7	Subordinates' achievement of environmental performance goals is controlled by their respective superiors.	1	5	4.07	0.952	0.872	1	5	3.85	0.914	0.821
Q8	Potential deviations from environmental performance goals have to be explained by the responsible subordinates.	1	5	4.06	0.962	0.904	1	5	3.72	1.013	0.855
Q9	Subordinates receive feedback from their superiors concerning the extent to which they achieved their environmental performance goals.	1	5	4.13	0.949	0.841	1	5	3.67	0.975	0.797
Personnel controls											
Q10	Our workforce is carefully selected whether it fits to our firm's environmental values and norms	1	5	3.91	0.970	0.906	1	5	3.53	0.979	0.653
Q11	Much effort has been put into establishing the best-suited recruiting process for an environmental job position	1	5	3.88	1.055	0.867	1	5	3.77	0.890	0.670
Q13	The environmental goal achievement is regarded as important condition for promotion	1	5	3.69	1.122	0.573	1	5	3.14	0.910	0.971
Cultural controls											
Q15	Our mission statement clearly communicates the firm's environment-related core values to our workforce.	1	5	4.17	0.911	0.745	1	5	3.92	0.961	0.679
Q16	Top managers communicate the firm's environment-related core values to our workforce.	1	5	4.27	0.893	0.613	1	5	4.00	1.029	0.667
Q17	Our workforce is aware of the firm's environment-related core values.	2	5	4.17	0.815	0.536	1	5	3.86	0.935	0.868
EMA											
Q29	Development and use of environment-related key performance indicators	1	5	3.52	3.52	0.672	1	5	3.59	1.192	0.651
Q30	Budgeting of environmental expenditures for operations	1	5	3.91	3.91	0.597	1	5	3.73	1.152	0.745
Q31	Life cycle assessment	1	5	3.37	3.37	0.971	1	5	3.06	1.182	0.605
Q32	Material-efficiency analysis in physical units	1	5	3.46	3.46	0.891	1	5	3.36	1.226	0.848
Q33	Material-efficiency analysis in monetary units	1	5	3.68	3.68	0.740	1	5	3.53	1.145	0.964
Suppliers											
Q38	Suppliers are selected according to their level of environment commitment.	1	5	4.19	0.959	0.774	1	5	3.63	1.006	0.808
Q39	Detailed information on environmental issues is regularly shared between major suppliers and our firm.	1	5	3.99	1.077	0.894	1	5	3.53	0.991	0.884
Q40	We commonly see targets for the suppliers for reducing the environmental burden.	1	5	4.01	1.028	0.975	1	5	3.29	1.115	0.914
Q41	The environmental policy involved with suppliers is stated.	1	5	4.03	1.009	0.962	1	5	3.38	1.170	0.856
Q42	The environmental burden in supply chains can be evaluated.	1	5	3.88	1.049	0.824	1	5	3.27	1.111	0.861
EDM											
Q19	Top management is actually involved in environmental management.	1	5	4.41	0.938	0.709	1	5	4.13	0.865	0.692
Q20	Environmental criteria are integrated in operational investment decisions.	2	5	4.45	0.810	0.920	2	5	3.86	0.856	0.630
Q21	All employees are encouraged to make suggestions in the field of the natural environment.	2	5	4.32	0.868	0.744	2	5	3.73	0.926	0.696
UEI											
Q34	To monitor internal compliance with environmental policies and regulations.	1	5	4.06	1.045	0.970	1	5	3.83	1.076	0.905
Q35	To provide data for internal decision-making.	1	5	3.91	0.993	0.901	1	5	3.76	0.981	0.923
Q36	To motivate continuous improvement.	1	5	3.80	1.075	0.811	1	5	3.67	1.068	0.834
Q37	To provide data for external reporting.	1	5	3.98	1.025	0.825	1	5	3.93	1.049	0.889

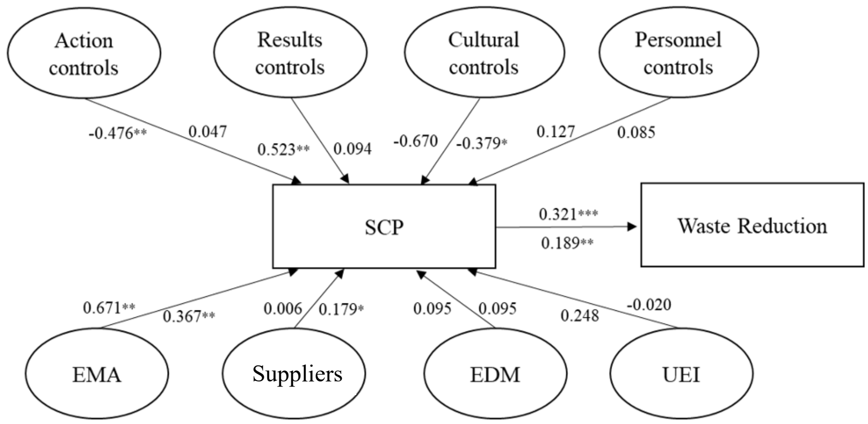
Notes: λ denotes the factor loading in EFA.

both countries. The implementation of SCP is significantly positively related to environmental performance (waste reduction) in both countries.

3.3 Discussion

The results of our analysis reveal four significant findings.

First, from the relationship between SCP and environmental performance (waste reduction), the results



$\chi^2 = 1.7580$, $p < 0.001$, df = 1362, CFI = 0.928, RMSEA = 0.040, SRMR = 0.0755 Note: $*p < 0.05$, $**p < 0.01$

Fig. 1 Multiple group structural equation modeling with environmental performance.
Figures to left of arrows: Thailand ($N = 86$), Figures to right of arrows: Vietnam ($N = 158$)

indicate that the implementation of SCP can improve environmental performance. Hence, it is appropriate to promote SCP policies at the corporate level.

Second, the results show that the role of EMA is positively significant for the implementation of SCP in developing countries. Following the EFA results, the companies undertaking budgeting of environmental expenditures for operations, life cycle assessment and material-efficiency analysis in physical and monetary units, particularly the use of environment-related key performance indicators, can drive the implementation of SCP policy. When companies implement SCP policy, these aspects provide hints for effective policies, using specific EMA instruments to advance environmental management.

Third, when discussing the impact of each element of the EMCS on SCP, the analysis does not show the same results in Thailand as in Vietnam. Statistical significance was observed for action controls and result controls in Thailand but not in Vietnam. This result indicates that in Vietnamese companies EMCS has not been developed to the same degree as in Thai companies.

Fourth, regarding Thai companies, it would be reasonable to assume that action controls negatively impact SCP implementation because these controls are very traditional and rigorous to some extent, such as the use of manuals and behaviour monitoring. It can be considered that since SCP is quite a new concept, certain traditional and rigorous management tools would not be effective for its purpose. In contrast, result controls address the use of environmental performance measures through target-setting, collecting actual figures, variance analysis and the impact on incentives as a process. As they allow for more flexible management than action controls, this may help them work effectively when companies introduce new business activities such as SCP policy.

4. Conclusions

In this study, we used data from Thai and Vietnamese companies with MGSEM to examine effective environmental management tools for promoting SCP and improving related environmental performance. We obtained positive results for the use of EMA in implementing SCP and the use of SCP in environmental performance in both countries. In addition, we confirmed positive results from result controls and the negative results from action controls with regard to the implementation of SCP in Thai companies, although neither are statistically significant in Vietnamese companies.

Since the analytical results for both countries show a positive impact of SCP on environmental performance, it is appropriate to promote companies' adoption of SCP policy. In Thai companies, more flexible environmental management tools would be more effective for SCP implementation than rigorous traditional tools. These findings suggest that when promoting SCP policy in developing companies, it is necessary to recognise that the effects of environmental management tools are not always the same. Since the level of environmental management in developing countries generally lags behind that in developed countries, it is advisable to encourage companies' use of basic manual environmental management tools. However, traditional management tools may work against new challenges, such as the implementation of SCP, so a more diverse menu of environmental management tools, including EMA, may be required.

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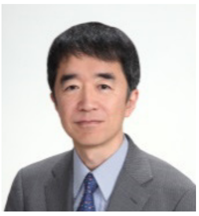

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