



ORIGINAL ARTICLE

Citation: Suksanchananun, W., Kot, S., Chaiyasoonthorn, W., & Chaveesuk, S. (2024). The model of White Supply Chain Management for sustainable performance in the food industry. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 19(4), 1405–1448. <https://doi.org/10.24136/eq.3328>

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Article history: Received: 22.08.2024; Accepted: 5.12.2024; Published online: 30.12.2024

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The model of White Supply Chain Management for sustainable performance in the food industry

JEL Classification: L17; L25; L26; L89

Keywords: supply chain; sustainable performance; green supply chain management; white supply chain management; food industry

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Abstract

Research background: The evolving business sector, driven by environmental factors and social pressure such as natural capital, global competitiveness, etc., necessitates continuous improvement and adaptation. The study presents White Supply Chain Management (WSCM), which incorporates ethical, social, and environmental practices into supply chains to enhance competitiveness. WSCM expands on Green Supply Chain Management (GSCM) by integrating principles of ethics and social responsibility towards achieving the SDGs. The variables include social pressure, ethical management and corporate social responsibility, promoting holistic sustainability across all supply chains.

Purpose of the article: The study's objectives were to examine the validity components of WSCM in the food sector, analyze the influence of WSCM on the long-term effectiveness of the Food Industry, and examine the WSCM model to see how it promotes long-term effectiveness in the food business.

Method: The research used a quantitative survey design to elicit responses from a sample group of 664 respondents, selected using a lottery-based random sampling method with 2–3 key informants per factory, typically occupying middle to high-level executive positions. The test tool was a structural equation model.

Findings & value added: The results show that WSCM and sustainable performance (SUS) are much improved by social pressure. WSCM further improves SUS. The findings emphasize the need for food sector stakeholders to interact with their publics (both internal and external), maintain ethical standards, and leverage supply chain analytics for transparency. Theoretically, the findings show how societal pressure drives sustainability through WSCM, therefore addressing issues outside of conventional Green Supply Chain Management. The study focuses on the necessity of implementing an integrated framework for managing the supply chain, comprising ethical, social, and environmental factors, and advises future research to test the WSCM framework in additional sectors and investigate its long-term effects on sustainability.

Introduction

There is a worldwide reawakening of the detrimental impacts of activities related to supply chains on society and the environment. This is because natural resources, which are regarded as natural capital, pose challenges and impact corporate operations. One such challenge is the rising energy demand, while energy supplies are depleting. Hence, it becomes an enormous challenge to establish equilibrium at a cost that is not excessively high (Gardner *et al.*, 2019; Katsaliaki *et al.*, 2022; Menon & Ravi, 2021). The adoption of Green Supply Chain Management (GSCM) is a consequence of achieving balance and restoring some sanity in the supply chain paradigm. GSCM is an organizational model that applies sustainable processes throughout the whole supply chain (SC). The process entails executing strategies to reduce the environmental impact at each phase, including product ideation, production, distribution, and waste disposal, while im-

plementing systems such as resource reuse, recycling, and proper disposal in landfills (Liu *et al.*, 2024; Islam *et al.*, 2024; Abdallah *et al.*, 2024). This technique exemplifies the 4R1D concept, which consists of reducing, reusing, recycling, reclaiming, and promoting degradation — highlighting a strong dedication to sustainability (Mayanti & Helo, 2024; Li & Li, 2024). Therefore, based on the "Earth to the Earth" philosophy, the GSCM approach requires collaborating with several stakeholders, including suppliers, designers, manufacturers, distributors, shippers, retailers, and others (Herrmann *et al.*, 2021; Javaid *et al.*, 2024).

Financiers are exerting pressure on corporations to reveal their sustainability practices. Research has indicated that a greater number of organizations aspire to conduct their operations in accordance with sustainability criteria recognized in the business industry (Balcerzak & MacGregor Pelikánová, 2020; Balcerzak *et al.* 2023). Hence, corporations operating in emerging market nations are dedicated to elevating ethical and environmental benchmarks. Approximately 21% of organizations in emerging economies and 15% of firms in mature markets intend to enhance their standards within the next two years (Cenci *et al.*, 2023; Morgan Stanley..., 2024; Muller & Konstantinov, 2024). According to recent studies by Brown (2024) and Buck (2024), 20% of organizations have implemented stricter policies while governing their SC activities. Businesses have expertly utilized this opportunity to assess and improve their SC network to enhance sustainability. This will enable them to maintain competitiveness in an increasingly challenging business environment. Several organizations have successfully achieved their objectives, as evidenced by 17% of companies reporting a reduction in their environmental footprint over the past two years (Bellassai, 2023). In addition to sustainability, social responsibility must also be considered. Prachatai (2016) addressed that in a report from Oxfam 2016, stating that having a socially responsible business is advantageous and will enable progress, adding that businesses must adhere to ethical practices to ensure their long-term sustainability. Rachel Wilshaw, the Ethical Trade Manager for Oxfam UK, emphasized the need for collaboration among the corporate sector to establish more rigorous standards and include civil society in monitoring supply chains. She pinpointed three industries that are susceptible to forced labor: the Thailand fishing sector, the Morocco strawberry business, and the Myanmar textile industry. The startling disclosures prompted the implementation of the Modern Slavery

Act 2015 in the UK, mandating UK corporations to publicly disclose their non-utilization of coerced labor in their supply chains.

However, morals and ethics are indispensable to sustainability of any enterprise. They are also applicable in acquiring standard products or services that help to equitably repay the value of investment to all stakeholders (Hyatt & Gruenglas, 2023), it also handles trading partners ethically and equitably (Khalid, 2024; Pfajfar *et al.*, 2022). While green supply chains have made significant progress, there is still a considerable gap to be bridged in addressing social and ethical considerations alongside environmental problems. In the food sector, where complicated supply chains often provide difficulties regarding labor, animal welfare, and environmental effects, this discrepancy is especially important. This research fills this void by presenting the idea of "White Supply Chain Management" (WSCM). Aiming for a whole approach to sustainability, WSCM goes beyond only environmental considerations by including ethical and social behaviors alongside environmental issues. We reimagine sustainability by applying color psychology to the concept of "whiteness," symbolizing ethical conduct, purity, and integrity along the whole supply chain, starting from its origin down to its final destination.

We, therefore, seek to connect this moral behavior to how businesses achieve their objectives, stay innovative and profitable, and demonstrate some understanding of the practicality of existing resources in a way that contributes to the attainment of the Sustainable Development Goals (SDGs). Following the adoption of the SDGs, several questions have emerged about the role of food systems owing to their significant impact on society, the economy, and the environment. An in-depth examination of the SDGs, groups, and metrics reveals that the food supply industry exhibits a more subtle than causal relationship with the variables. The Food and Agriculture Organization (FAO) of the United Nations (2015) indicates that eight SDGs are directly correlated with food supply.

Ferrer (2024) notes that the SDGs have achieved the maximum level of consensus in society regarding their significance to sustainability; this situation being equivalent to or more powerful than a legal requirement. In the context of the food sector, numerous connections can be ascertained between food sustainability and the SDGs. Realizing the SDGs necessitates the responsible management of significant transformations within the global food system, which involves hundreds of millions of farmers and their families, international supply chains, numerous food production

enterprises, varied agricultural processes, natural environments, food production, and a wide array of culinary customs. Businesses understand their need to make major adjustments to match their operations with the SDGs, but many current sustainability models are not suitable for this aim. However, few efforts have been made to elaborate on the significance of the food industry in attaining the SDGs from an expansive food supply chain framework.

Also, as an evolving field with limited direct data from studies, most research in this area were integrated from supply chain management studies, ethical and morality studies as well as the economic (banking sectors. Studies like Chauhan *et al.* (2022) examined how teamwork involving supply chain collaborations help in achieving the SDGs. Suksanchananun *et al.* (2024) tested instruments for measuring the model of WSCM for sustainable performance in the Thai food industry. The conference paper validated the instrument of data collection in relation to the study. The authors, earlier, in 2023 carried out a literature review of relevant issues by different scholar in the field of sustainability and supply chain exploring regional variables (Suksanchananun *et al.* 2023). Thus, one of the core gaps the study fills is contributing data to understand WSCM from the perspective of integrating GSCM, CSCM, and ESCM. Based on these, the study aims include;

1. To investigate the validity and components of WSCM in the food industry.
2. To explore how WSCM has affected the continuing effectiveness of sustainability efforts in the food business.
3. To develop a WSCM framework specifically designed for achieving sustainable performance in the food business.

The research provides practical perspectives for food sector stakeholders that aim to achieve long-term profitability while mitigating environmental and social hazards by recognizing the influence of WSCM on sustainability.

Literature review

Over time, GSCM has evolved in definition, with these changes being impacted by advancements in knowledge and technology. Hariyani *et al.* (2024) defined GSCM as innovation in supply chain management, including purchasing, under consideration in an environmental context. Hariyani

et al. (2024) viewed GSCM as environmental supply chain management, which consists of participating in various activities related to purchasing, including reduction, recycling, reuse, and materials substitution. Khanal *et al.* (2023) conducted a study that evaluated the performance measurement for GSCM to present an overview of different issues linked with measuring the performance of GSCM. They collected data using experiences, case studies, and literature on measuring efficiency in environmental SC. The study results provide an extensive structure for designing and evaluating GSCM tools, and the frame found operations under green supply chain management will include external pressures, internal controls, and environmental performance indicators.

Hsu and Hu (2008) were interested in GSCM in the electronic industry to verify consistency with factor analysis and fuzzy analytic hierarchy process method to prioritize GSCM implementation. The research results found that the electronics industry will focus on the efficiency of SC in a crucial part in executing GSCM and on building an environmental database. Most importantly, it has the support of top management. The Bureau of Logistics DPIM (2015) defined GSCM as SCM in terms of reducing the environmental impacts arising from activities in the course of SC given the foundation and procurement procedure of material resources design assembly operations, services, internal and external transportation processes, consumption, as well as management during every stage of the product's life cycle and other factors of production. Sibel and Bulent (2019) studied how GSCM practices affect sustainability performance and explored the eight dimensions of GSCM: green manufacturing, internal environmental management, green distribution, green purchasing, green packaging, green marketing, environmental education, and recovery of investments.

Thi (2020) investigated the effect of GSCM strategies on sustainability performance in Vietnam construction sector, examining how GSCM strategies influence sustainable performance. They showed that green design and production positively and significantly impact the economy, society, and environment. In contrast, green purchasing affects economic and social efficiency but does not influence environmental performance. Fazal *et al.* (2020) implored that it is critical to recognize the importance of ecology and sustainability in the SCM process. They analyzed GSCM techniques to explore their impact on the environment and performance. This examination included considering guidelines such as environmental management within the company and sustainable SCM involving customers and vendors.

Based on the definitions and the review of relevant literature, GSCM can be subdivided into five key components crucial in efficiently managing the supply chain in an environmentally friendly manner (Alzubi & Akkerman, 2022; Shekarian *et al.*, 2022):

- Green Purchasing – Considering environmental impacts in the procurement process, such as selecting raw materials or products that are environmentally friendly.
- Green Manufacturing – Applying environmental concepts in the production process to reduce waste and use resources efficiently.
- Green Distribution – Transporting and distributing products using methods that minimize environmental impact, such as choosing energy-efficient vehicles.
- Internal Environmental Management – Integrating environmental issues into the organization's internal management, including employee training on environmental aspects.
- Investment Recovery – Reusing or recycling materials or products to reduce resource loss and generate revenue from reuse.

Corporate social responsibility (CSR)

Assuming responsibility for suppliers is crucial in contemporary society, as manufacturers and vendors are expected to be aware of their business collaborations with suppliers who demonstrate ethical conduct and values towards employees, society, and the environment (Macgregor Pelikanova *et al.*, 2024). This awareness ensures proper oversight and urges other firms to improve their operations and adapt (Boyd *et al.*, 2007; Belas *et al.*, 2024; Dvorský *et al.*, 2023). Conversely, choosing a supplier that does not prioritize employees' safety and health, regardless of the environment, can have negative consequences. Such situations can damage the parent company's reputation. Employers prioritizing CSR in SCM can identify hazards related to the workplace, labor, employee health, environment, and security (Truant *et al.*, 2024; Zhang *et al.*, 2024).

Maintaining product safety, quality, and brand reputation is paramount (Asia-Pacific Economic Cooperation, 2007); Ogunyemi *et al.* (2024) noted that the food industry faces risks related to CSR challenges in the SC. Their research covered the protection of animals, biological technology, ecology, equitable trade, safety and health, workforce, and the protection of human rights. Similarly, Urbaniak (2015) examined how CSR utilized SC relationships to define concepts and identify critical elements of CSR in building supply chain partnerships for multinational companies. Analysis results

show that buyers often have detailed ethical standards for suppliers. Finally, SC social responsibility initiatives and supply chain CSR checklists control supplier performance.

Ethics of supply chain

Supply chain ethics draws the attention of researchers from various perspectives and has been in development for a long time, from the past to the present; the objective is to reduce buyer risk (Keating, 2009; Nguyen & Zuidwijk, 2004). It is sensitive to ethical considerations related to procurement and supply chain management (SCM), because procurement practitioners are often entrusted with large amounts of financial resources within the organization (Zhang *et al.*, 2024; Truant *et al.*, 2024).

Supply chain ethics is equally applicable to any affiliate of a supplier and any agent or subcontractor of suppliers (Ahmed *et al.*, 2024; Thomson Reuters, 2015) within the manufacturing plant, distribution, and center until the product reaches the customer. A company that does not act ethically risks its reputation (Khan *et al.*, 2023). However, due to the function of the supply chain, the responsibility for monitoring, controlling, and selecting suppliers cannot be relieved, because it is a legal and ethical principle (Hyatt & Gruenglas, 2023); it is also the main objective of the supply chain. Treating customers by delivering carefully developed products and services is also considered ethical in the supply chain (Jermsittiparsert & Srihirun, 2019).

Color concept

A company's color scheme is one of its most basic identifiers; customers' memories are created by deriving from the colors of the design symbols (Kijtham, 2015; Koula, 2024). Color, according to Jonauskaite *et al.* (2020), has a profound impact on our emotions and state of mind: white represents purity, cool, and straightforward. Yellow represents qualities such as friendliness, camaraderie, and happiness. The color green is associated with tranquility, nature, and liveliness. Orange symbolizes attributes such as inventiveness, self-assurance, cheerfulness, and pleasure. The color red signifies fervor, stimulating, demanding, and cost-driven. Pink is sweet and soft. Purple is luxury, elegance, and mystery. Blue is light, freedom, calm, serenity, and more creativity. Brown is steady, decisive, calm, and

simple. Gray is balanced, cooperative, and neutral. Black is strength, mystery, and challenge.

Kanagaraj *et al.* (2020) introduced the concept of color psychology, which reveals the intricate relationship between color and human psychology. This concept, which interprets color through emotion, offers a unique perspective on the world through the lens of color theory. It not only fascinates with its insights into human psychology (Srivastava *et al.*, 2022), but also demonstrates its practical applications in management theory. Researchers have effectively utilized psychological insights on color to inform management practices, resulting in inventive techniques such as *White Ocean Strategy* by Chanchaochai and *Six Action Shoes* by Edward de Bono (Kanuri *et al.*, 2023; Schloss, 2023). Color is critical in symbolizing an organization and leaving a lasting impression on customers; different colors can evoke a range of emotions and moods, as Jonauskaite *et al.* (2020) demonstrated. For instance, white symbolizes purity and calmness, and is often associated with honesty and ethics. This understanding has resulted to the concept of 'WSCM,' which encompasses GSCM, CSR, and ethics.

Conceptual model and hypotheses development

White SCM components

The White Supply Chain Management (WSCM) approach integrates three key components: GSCM, Corporate Supply Chain Management (CSCM), and Ethical Supply Chain Management (ESCM). These components, when combined, create a universal method to sustainability that encompasses environmental, social, and ethical considerations. GSCM emphasizes minimizing the environmental impact of supply chain operations. It involves adopting practices like reducing resource consumption, using renewable energy sources, and implementing efficient logistics systems to minimize environmental footprint (Khanal *et al.*, 2023; Islam *et al.*, 2024). GSCM focuses on establishing systems and processes to monitor and manage environmental performance within the organization (Abdallah *et al.*, 2024; Bureau of Logistics DPIM, 2015). Furthermore, it prioritizes suppliers who demonstrate environmentally responsible practices and source materials sustainably (Sibel & Bulent, 2019).

CSCM focuses on the socioeconomic effects of SC activities on various stakeholders. It involves labor practices which ensure equitable labor systems, observing human rights, providing a safe work space all through the SC (Hutchins & Sutherland, 2008; Urbaniak, 2015). CSCM also emphasizes fostering linkages with the local publics while promoting economic development in the regions where supply chain activities occur (Ogunyemi *et al.*, 2024; Susitha *et al.*, 2024; Zhang & Huang, 2024). Moreover, it involves establishing ethical and transparent trading relationships with suppliers and partners. ESCM promotes ethical behavior and decision-making across all aspects of the supply chain. It involves maintaining transparency, honesty, and trust in all business dealings and relationships (SCMA, 2014). ESCM also emphasizes upholding the rights of all stakeholders, including workers, consumers, and communities (Awa *et al.*, 2024). It also involves engaging in ethical competition and avoiding practices that harm competitors or consumers (Yusuf *et al.*, 2014). These views were the basis for proposing the first hypothesis:

H1: *The white supply chain management framework integrates principles from GSCM, CSR, and ESCM practices.*

Effect of social pressure (SP) on WSCM

To investigate the effects of social pressure on white supply chain management, Sparacino *et al.* (2024) found that multinational companies adopted CSR in their supply chains due to different legal and cultural pressures. Ferrell and Ferrell (2016) presented a framework for working within supply chains that must adhere to ethical standards set by international organizations. Hebaz *et al.* (2024) discovered six pressures that impact GSCM: government regulations and guidelines, global productivity, consumer, outside influences, financial considerations, manufacturing and business aspects.

Miller *et al.* (2024) suggested that organizations must comply with ethical principles, because they are subject to ethical evaluations as raw material suppliers. Raw material suppliers have to manage information from the supply chain, inspire vendors to pay for audits and fill out surveys, react to audit results showing ethical SC violations, and raise consumer knowledge of ethical SC. Therefore, this paper hypothesizes the following:

H2: *Social pressure influences the practices and outcomes of WSCM.*

Effect of WSCM on sustainable performance (SUS)

White supply chain management comprises GSCM, CSR, and ethics. Research indicates that these three components have an impact on sustainable performance, as evidenced by the following studies (de Almeida Couto & Natário, 2023; Kot *et al.*, 2019; Wongleedee, 2020; Sibel & Bulent, 2019). Wongleedee (2020) discovered that GHRM and GSCM affect the SUS of pharmacies in Thailand.

Sadaat and Stefan (2015) developed a model of CSR in SCM that impacts performance outcomes in both economic and social aspects. Hafiz *et al.* (2020) demonstrated that internal management and external management SSCM activities are positively and significant tied to a firm's sustainable performance. Shafiq *et al.* (2020) found that the ability of SC analytics to interact with consumer pressure for ethical behavior enhances the social and financial performance of suppliers.

H3: *The implementation of WSCM significantly influences an organization's overall sustainable performance.*

Effect of social pressure (SP) on sustainable performance (SUS)

Prior study has demonstrated that SUS is influenced not only by white supply chain management, but also by social pressure (Kukreti *et al.*, 2021; Bui *et al.*, 2020; Lu *et al.*, 2018). Zhan *et al.* (2016) surveyed and found that implementing green and lean practices in Chinese manufacturing organizations is critical to improving the environmental and business performance of those implementing organizations. Lu *et al.* (2018) discovered that institutional pressure on sustainable supply chains can be linked to socioeconomic and environmental performance results.

Regarding how this works in shipping, rising environmental protection standards of merchants have driven maritime service companies to rethink their business procedures in line with the evolving structure of global marketplaces and growing sustainable needs. For maritime shipping firms under public regulatory and competitive constraints, balancing economic expansion with lowering the environmental effect of maritime operations has become ever more crucial (Phonthanukitithaworn *et al.*, 2024; Raza *et al.*, 2023). Kukreti *et al.* (2021) earlier identified 12 factors influencing sus-

tainability performance. Therefore, the authors propose the following hypothesis:

H4: *Sustainable performance is shaped and improved in great part by social pressure.*

The model in Figure 1 illustrates these hypothesized relationships.

The arguments from the literature confirm the need of incorporation of the three WSCM components GSCM, CSCM, and ESCM to develop an adaptable approach to addressing issues around sustainability in the food industry. Khanal *et al.* (2024) advocate that the internal and external components of GSCM need to be integrated by organizations to promote sustainable performance, while also analyzing the interaction linking GSCM operations and organizational performance, which they consider vital. This paper suggests a management strategy for using WSCM for sustainable performance in food companies and tackles the main challenges in effectively integrating GSCM, CSCM, and ESCM techniques.

Methods

The study utilized a quantitative survey research design. The research focused on assessing the effectiveness of the WSCM model in promoting SUS within Thailand's food sector. The participants in the study were individuals employed in the food business. Researchers selected food manufacturers from mid-to-senior management positions such as factory managers, supervisors, plant/division managers, chief executives, and company representatives. These categories of respondents were targeted because supply chain is a management function and only those in managerial positions have the authority to make supply chain choices and provide input on the direction of supply chain operations for firms. The respondents were additionally required to have at least a 5-year working experience in their current position. They also had to be qualified for the survey by having a bachelor's degree or above. The participants were chosen by a process of simple random sampling. They were limited to between one and three (1–3) per organization to ensure a focused and consistent perspective while minimizing potential biases from excessive internal diversity of opinions.

G*Power version 3.1.0.7 was used to determine the sample size. The software is a multifunctional tool that does statistical power evaluations for different tests, including effect sizes, and graphically presents the results of power estimates. The researchers assigned an effect size of 0.5, the internationally recognized large effect size according to the gold standard (Kang, 2021; Kraft, 2020). The power of the test is assigned equal to 0.80 (Hair *et al.*, 2010), and df is calculated from the number of observed variables as shown in the formula below.

$$df = NI(NI + 1)/2 = 64(64 + 1)/2 = 2,080 \quad (1)$$

where:

NI number of observable variables = 64.

Pre-test and pilot study

Four academics and food industry executives assessed the questionnaire for validity using the item-objective congruence (IOC) measure, proving its reliability. After that, 30 participants were asked to fill in the questionnaire, and it was later revised based on the experts' recommendations. The respondents were drawn from 10 suppliers, distributors, and producers respectively in the Thai food industry. With Cronbach's alpha (>0.70), SP (0.88), WSCM (0.95), and SUS (0.94), the three constructs demonstrated a high degree of internal consistency in the pilot study. The overall questionnaire had a Cronbach's alpha of 0.95.

Measure development and data assessment

Using 5-point Likert-scales, where 1 represents "strongly disagree" and 5 represents "strongly agree," all constructs were derived from earlier research. The social pressure (SP), denoted by customer pressure, regulations, global competitiveness and natural capital, was assessed using scales by Daniel (2016), aligning with Hebaz *et al.* (2024) and Constantin and Antony (2012). White supply chain management (WSCM), represented using GSCM, CSCM, and ESCM, was evaluated using scales by Sibel and Bulent (2019), Thi (2020), Wongleedee (2020), Sadaat and Stefan (2015), Hafiz *et al.* (2020), and Shafiq *et al.* (2020), Ferrell *et al.* (2013). The sustainable performance (SUS), representing people performance, profit performance, and planet performance, was assessed utilizing scales adapted from Sadaat and

Stefan (2015), in consistency with Jaffar *et al.* (2019) and Suriyankietkaew and Avery (2016).

Before analysis, the preliminary data was screened and examined as follows:

1. To check the Mahalanobis Distance data, the outlier investigation showed 36 outliers, so this study was left with 664 samples.
2. To check the normal distribution of the data found that the Skew Index (SI) was between -0.612 and 0.015, which was not more than 2 it was considered symmetrical or not very skewed, and the Kurtosis Index (KI), ranged from -1.531 to 0.916, no greater than 7. The data were normal distribution (West *et al.*, 1995).
3. The investigation found that the multicollinearity between latent variables in the structural equation model and the correlation coefficient between latent variables is not more than 0.80, so within the structural equation model latent variables do not exhibit any issues with multicollinearity.
4. The suitability of the samples was examined showing (Kaiser-Meyer-Olkin: KMO) was 0.7, which is very high (nearly 1) (De Vaus, 1991), meaning that the sample group is suitable. The data can be analyzed for the corroborative component.
5. To check whether the population correlation metric was an identity matrix or not, it was found that Bartlett's test statistic was less than 0.05, indicating that the correlation metric was not an identity metric, meaning that the variables were completely independent of each other, therefore grouping of variables to form components is possible, so the confirmation component should be further analyzed.

A confirmatory factor analysis (CFA) was conducted to determine the validity of the scales. Table 2 presents a detailed list of all the items used to construct the final model, together with the corresponding psychometric parameters of the evaluations. The measurement instrument demonstrates high levels of reliability and validity. The composite reliability (CR) varies from 0.75 to 0.94, while the average variance extracted (AVE) falls between 0.51 and 0.90. The CFA loadings range from 0.52 to 0.95, indicating that convergent validity is achieved, as shown in Figure 2.

Results

Structural model — confirmatory factor analysis

The structural model, developed from current theories and reflective, was evaluated using AMOS (v.26). The overall fit measures indicate that the hypotheses model adequately represents the empirical data (Steiger, 2007): $\chi^2/\text{df} = 1.233$, GFI = 0.926, AGFI = 0.917, CFI = 0.965, TLI = 0.962, RMSEA = 0.019 and RMR = 0.025. The model fit is presented in Table 3. Therefore, H1 is supported. The white supply chain management (WSCM) consists of GSCM, CSCM, and ESCM.

Structural model — direct effect

Table 3 shows that social pressure (SP) has a significant positive direct effect on white supply chain management (WSCM), with $\beta = 0.61$ and $p = 0.00$. The results show that social pressure (SP) has a favorable impact on sustainable performance (SUS) ($\beta = 0.64$, $p = 0.00$), supporting hypothesis 4.

Structural model — mediation effect

Examining mediation effects as conceptualized earlier in hypothesis three (H3), well-established procedures of Baron and Kenny (1986), Kelloway (1995), and Zhao *et al.* (2010) were used to test all significant parameters in the mediation test stages, interpretation of partial and full mediation conditions, and indirect or direct effect conditions, respectively. Additionally, the standardized indirect effect technique of structural equation modeling (SEM) was employed. The findings indicate that white supply chain management (WSCM) has a significant beneficial impact on sustainable performance (SUS) ($\beta = 0.431$, $p = 0.00$), supporting H3.

Discussion

The confirmatory factor analysis demonstrated that the WSCM framework, which includes GSCM, CSCM, and ESCM, is a good fit for the empirical data. The structural model's strong fit indices ($\chi^2/\text{df} = 1.233$, GFI = 0.926,

AGFI = 0.917, CFI = 0.965, TLI = 0.962, RMSEA = 0.019, and RMR = 0.025) indicate that the hypothesized model adequately represents the empirical data and meets the acceptable criteria, thus supporting Hypothesis 1 (H1). This indicates that the WSCM framework is a feasible and reliable architecture. This finding emphasizes that WSCM is a comprehensive framework that include GSCM, CSCM, and ESCM. The result agrees with the literature that posits WSCM as an integrated approach addressing the environmental, social, and ethical dimensions of supply chain operations (Khanal *et al.*, 2023; Sibel & Bulent, 2019; Islam *et al.*, 2024). It reflects a growing trend in sustainable supply chain practices that have been increasingly adopted by organizations to meet the demands of both regulatory bodies and stakeholders.

These findings also conform with previous studies and highlight the relevance of including environmental, social, and ethical components in supply chain management. Islam *et al.* (2024) and Tran (2024) contend that sustainable supply chain management should incorporate both environmental and social factors to attain long-term success. Sibel and Bulent (2019) emphasize that ethical and socially responsible activities are essential elements of a sustainable SC, as seen from the WSCM framework.

The significant positive direct effect of social pressure (SP) on WSCM ($\beta = 0.61$, $p = 0.00$) as well as on sustainable performance (SUS) ($\beta = 0.64$, $p = 0.00$) supports Hypothesis 2 (H2) and Hypothesis 4 (H4). These findings are consistent with previous studies, showing that external pressures, such as societal expectations, government regulations, and consumer demands, play a pivotal role in driving organizations to adopt sustainable supply chain practices (Sparacino *et al.*, 2024; Hebaz *et al.*, 2024; Miller *et al.*, 2024). This highlights how social pressure can be a powerful motivator for firms to integrate sustainability and ethics into their operations. The literature consistently shows that companies operating in global markets, especially those with a complex supply chain network, face increasing scrutiny and expectations to uphold social and environmental responsibilities (Lu *et al.*, 2018; Bui *et al.*, 2020).

Importantly, the study revealed a notable positive impact of social pressure on white supply chain management ($\beta = 0.61$, $p = 0.00$) when considering the interactions between SP and WSCM. This indicates that external social factors, such as regulatory requirements, customer expectations, and global competition, have a significant impact on how firms adopt and execute sustainable and ethical supply chain policies. This discovery aligns

with the research conducted by Sarkis (2014), which revealed that external influences, such as legislative mandates and market dynamics, compel firms to embrace more environmentally sustainable methods in their supply chains. Likewise, Miller *et al.* (2024) showed that corporations are becoming more and more affected by the demands of stakeholders to improve their SC sustainability. This aligns with findings from this study, which highlighted a direct association between societal pressure and the implementation of sustainable practices in SCM.

The mediation analysis provided evidence that WSCM had a substantial impact on sustainable performance ($\beta = 0.431$, $p = 0.00$), supporting Hypothesis 3 (H3). This discovery suggests that implementing white supply chain principles directly enhances sustainable performance, which includes aspects related to people, profit, and the earth. This outcome is consistent with Elkington's (1999) TBL framework, which asserts that sustainable performance should be evaluated based on social, environmental and economic aspects. The favorable impact of WSCM on SUS corroborates the idea that incorporating environmentally friendly, morally upright, and socially accountable methods into the supply chain results in superior sustainability outcomes. Research conducted by Hafiz *et al.* (2020) and Sadaat and Stefan (2015) provides more evidence supporting these conclusions, demonstrating that the application of GSCM techniques has a good impact on both environmental and economic performance. These factors are crucial components of the larger notion of sustainable performance. The strong mediating role of WSCM suggests that organizations focusing on ethical and socially responsible supply chains enhance their overall sustainable performance, a finding that adds nuance to existing models of sustainable supply chain management.

The positive and significant mediation effect of WSCM on SUS further illustrates how integrated supply chain approaches can enhance an organization's sustainability outcomes. The mediation analysis, grounded in established procedures from Baron and Kenny (1986) and Zhao *et al.* (2010), clarifies the direct and indirect effects of WSCM, emphasizing its critical role in influencing organizational performance in terms of sustainability. This supports the idea that firms adopting a holistic supply chain model — including green, ethical, and CSR dimensions — are better positioned to meet sustainability targets compared to those focusing on one isolated aspect of the supply chain (McCarthy & Kearney, 2020; Farhan & Sadiq, 2021). The findings also highlighted the central role of SP in driving WSCM

practices. The results indicate that social pressure significantly influences both WSCM and sustainable performance, suggesting that external forces such as consumer advocacy, regulatory requirements, and stakeholder activism are key drivers in shaping corporate sustainability behaviors. This is consistent with the growing influence of social movements and regulatory frameworks such as the Modern Slavery Act (2015) and the European Green Deal, which exert pressure on organizations to be more transparent and responsible in their supply chain operations (Vela Almeida *et al.*, 2023; García-Sánchez *et al.*, 2023). This study adds to the body of knowledge by highlighting the importance of WSCM in emerging markets, where organizations may face unique social and environmental challenges compared to their counterparts in developed economies. In these contexts, firms are increasingly responding to local and global pressures by adopting more ethical and sustainable supply chain practices to improve their competitiveness and legitimacy (Mugoni *et al.*, 2024). The significant effect of social pressure on WSCM also suggests that firms in these markets are recognizing the strategic value of sustainability in enhancing their global standing.

The results also demonstrate the significant positive direct influence of SP on SUS, further confirming the belief that external forces are instrumental in determining an organization's sustainability trajectory. The significant impact of social pressure on sustainable performance ($\beta = 0.64$, $p = 0.00$) stresses the influential role that external pressures have in compelling firms to pursue sustainability. This discovery implies that firms facing higher levels of social pressure are more inclined to improve their sustainable performance by implementing policies that impact society, economy and environment positively. This finding agrees with Kukreti *et al.* (2021), who posit that companies under greater stakeholder pressure are more inclined to undertake proactive environmental and social efforts, resulting in enhanced sustainable performance. Similarly, Zhan *et al.* (2016) study on sustainable Chinese manufacturing competitiveness suggests that businesses adhere to external influences to establish credibility, which, in turn, leads to improved long-term performance.

Social pressure, in this context, serves as both a catalyst and a compliance mechanism, pushing firms to implement practices aligned with environmental and ethical standards. This finding resonates with existing literature, where social pressure, especially from consumers, regulatory bodies, and NGOs, has been shown to influence corporate strategies toward sustainability (Hermundsdottir & Aspelund, 2022; Rosário & Figueiredo,

2024). In particular, firms that are proactive in responding to such pressures tend to experience positive outcomes, not only in terms of environmental performance but also in financial performance due to enhanced brand equity and consumer trust (Herremans *et al.*, 2016).

The combination of green, corporate social responsibility, and ethical supply chain management in the WSCM model provides a holistic framework that integrates various aspects of sustainability. Scholars argue that environmental, social, and ethical dimensions are interdependent and require collective attention to achieve long-term corporate sustainability, reflecting a growing trend in sustainability research (Gimenez & Sierra, 2013; Pagell & Wu, 2009). Through the integration of these components within the SC, businesses can build a more flexible and stronger model equipped to meet present and future environmental issues. In addition to the structural relationships confirmed through this study, the implications of WSCM extend beyond immediate business benefits. The model highlights the necessity of stakeholder collaboration and transparency across the entire supply chain. Stakeholders such as suppliers, distributors, and consumers are increasingly demanding more visibility into business operations, especially concerning ethical sourcing, waste management, and labor practices (Khalid, 2021). Organizations that implement WSCM practices, therefore, not only meet these demands, but also build stronger relationships with their stakeholders, which can be critical in navigating the complexities of global supply chains (Dharmayanti *et al.*, 2023; Siems *et al.*, 2023).

This study reveals gaps that exist in the implementation of WSCM across industries, particularly in terms of social and ethical considerations. Despite the increasing focus on environmental sustainability, we must prioritize addressing ethical aspects like labor conditions and fair trade, as they are equally crucial for attaining holistic supply chain sustainability (Pfajfar *et al.*, 2022). Firms that focus solely on the environmental dimension without considering the social and ethical components may miss out on the broader benefits of WSCM, including enhanced social legitimacy and stronger stakeholder trust.

Furthermore, the study enhances our knowledge of the components of WSCM. The results also agree with existing research on the components of GSCM (Bureau of Logistics DPIM, 2015; Sarkis, 2014), CSCM (Truant *et al.*, 2024; Hutchins & Sutherland, 2008), and ESCM (Awa *et al.*, 2024; SCMA, 2014; Yusuf *et al.*, 2014). However, this research uniquely synthesizes these

components into a cohesive model of WSCM, providing a framework for integrating ethical, social, and environmental considerations within the food industry's supply chains. The study's findings offer several practical implications for food industry stakeholders:

1. **Prioritizing Stakeholder Engagement**, Companies must actively interact with stakeholders, such as suppliers, workers, consumers, and host communities, to ensure socially and ethically responsible practices throughout the supply chain.
2. **Implementing robust ethical and social standards**, firms need to cultivate and execute robust ethical and social standards, incorporating aspects like fair labor practices, transparent procurement, and environmental stewardship.
3. **Utilizing Supply Chain Analytics**, Companies can leverage supply chain analytics to identify and mitigate potential ethical and social risks, promoting transparency and accountability within the supply chain.

This study emphasizes the significance of implementing an integrated approach to SCM that includes environmental, ethical, and social factors. Adopting the principles of WSCM (Waste and Sustainable Consumption Management) by organizations in the food industry can improve their sustainable practices and positively contribute to the well-being of stakeholders and the environment. Subsequent studies could examine the suitability of the WSCM framework in different sectors and analyze the lasting consequences of adopting WSCM practices on organizational performance and societal influence.

Conclusions

This research on White Supply Chain Management (WSCM) within the food sector contributes to the changing dynamics of sustainable business practices. The WSCM in the food business encompasses GSCM, CSCM, and ESCM; it highlights the importance of integrating ethical, social, and environmental considerations into supply chain management to enhance long-term performance and competitiveness. The study employed a quantitative survey approach, drawing a population from mid-to-senior management positions in selected food manufacturers, including factory managers, supervisors, plant/division managers, chief executives, and company representatives. The overall fit measures imply that the hypothesis model accu-

ately represents the empirical data. Social pressure positively influences WSCM and sustainable performance, as evidenced by statistically significant data. Therefore, it can be inferred that WSCM is crucial for sustainability in the food processing company. The food processing sector can utilize this strategy to establish long-term viability. The findings demonstrate that social pressure significantly influences WSCM adoption and sustainable performance in the food industry, highlighting the increasing significance of stakeholder expectations and social demands in influencing company operations. The research demonstrates that WSCM adoption favorably influences sustainable performance, suggesting its efficacy as a complete strategy for attaining holistic sustainability in supply chains. Important lessons for food industry players are the need to keep high ethical standards throughout the supply chain; the need for proactive engagement with both internal and outside stakeholders to address social and environmental concerns; and the value of using supply chain analytics to improve transparency and traceability. From a theoretical standpoint, this study broadens the scope of traditional Green Supply Chain Management by incorporating ethical and social aspects, thereby providing a more comprehensive framework for sustainable business operations. The WSCM model presents a more complete method of supply chain management and tackles more general sustainability challenges. The WSCM model offers a good path for businesses trying to improve their sustainability initiatives while maintaining their competitiveness as the business sector develops. Future studies should explore the application of the WSCM model across various sectors and examine its long-term impact on sustainability outcomes.

Theoretical contributions

This study examined the importance of SCM in the Thai food industry, focusing on its impact on sustainability. It addresses the movement of resources along the whole SC and how firms are forced to modify their methods in response to societal influence. This research yields significant benefits for academia in different ways: one aspect is understanding social pressure and uncovering the components of societal pressure, including natural resources, governmental laws, consumer demands, and international competitiveness. The primary factor of significance is regulations. Prior to doing this research, each firm had sequentially conducted its activities from the first stages to the final stages, taking into account solely envi-

ronmental factors, which is referred to as green supply chain management. This study demonstrates that all activities within the supply chain, from the first stages to the final stages, should not only take into account environmental factors, but also incorporate social responsibility and ethical considerations. This integrated approach is sometimes referred to as white supply chain management. The organization prioritizes social responsibility. Organizational sustainability is ultimately attained by firms responding to social pressure and implementing white supply chain management practices to enhance their operations. This, consequently, ensures the sustainability of the organization across various dimensions, such as financial profitability, human resources, and environmental impact.

Managerial implications

SCM is the oversight and coordination of several operations involved in acquiring raw materials or services from suppliers, transforming them into finished items, and delivering and distributing them to clients. SCM is a commonly utilized process in enterprises and has evolved into the concept of GSCM. GSCM is the strategic approach of efficiently managing the supply chain to reduce the negative environmental effects associated with sourcing and acquiring raw materials. This also includes the process of designing and manufacturing processes associated with products and services, internal and external transportation procedures, consumption, and management throughout the whole life cycle of the item, together with other production elements. The primary goal is to accomplish significant objectives that improve the efficiency of activities across the supply chain, decrease logistical costs, and enable prompt, high-quality, and dependable responses to consumers (Bureau of Logistics DPIM, 2015). This study expands upon the concept of GSCM, which enables firms to establish and uphold ethical and socially responsible relationships with suppliers, employees, and customers. This includes practices such as using safe raw materials in product manufacturing, adhering to accounting and financial standards, distributing economic benefits equitably, and maintaining honesty with customers, employees, and stakeholders. These factors will facilitate the organization's ability to fulfil consumer needs and society until sustainability is ultimately attained.

This finding also has practical implications, particularly for industries facing stringent social and environmental regulations, such as manufactur-

ing and consumer goods sectors. The results suggest that by embedding WSCM practices, these firms can not only meet regulatory compliance, but also improve long-term business performance. The literature also corroborates this relationship, noting that companies implementing ethical and environmentally conscious supply chain practices often experience reduced risks, lower costs, and improved market reputation (Walker *et al.*, 2014; Brik *et al.*, 2019). In particular, the alignment of WSCM with corporate sustainability strategies tends to result in enhanced resource efficiency, better waste management, and reduced carbon footprints (Mehta *et al.*, 2019).

Future research directions and limitations

This study builds on the notion of GSCM and offers the innovative concept of WSCM, which has not been previously described. Hence, color theory must be employed to precisely delineate it. Furthermore, locating explicit citations is extremely challenging. Hence, it is imperative to utilize established theory and integrate it with color theory once more. Particularly noteworthy is the need to ensure completeness of data while gathering information from a sample group. In instances when a set of data was found to be incomplete, it had to be excluded, resulting in a prolonged data collection duration. The researcher gathered a total of 700 comprehensive questionnaires. However, while applying the Mahalanobis Distance method to detect outlier values, it was determined that there were 36 samples with outlier values, as evidenced via by a p-value of less than .001 (Hamid, 2019). Consequently, this study retained precisely 664 samples after accounting for the outliers. The overall fit measures imply that the hypothesis model accurately represents the empirical data. To ensure the universal applicability of white supply chain management across all industries. Furthermore, this methodology can be utilized in other sectors to examine the consistency of measurements across different groups applying structural equation model analysis.

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Compliance with ethical standards

This article does not contain any studies with human participants or animals performed by the authors. Extracting and inspecting publicly accessible files (scholarly sources) as evidence, before the research began no institutional ethics approval was required.

Data availability statement

All data generated or analyzed are included in the published article. The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation. The raw anonymized data can be provided by emailing the primary author.

Author contributions

All listed authors have made a substantial, direct and intellectual contribution to the work, and approved it for publication. The authors take full responsibility for the accuracy and the integrity of the source analysis.

Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Annex

Table 1. Construct, dimension, items, and CFA standardized loading

Construct/Dimensions	Item	Convergent Validity				
		Factor Loadings	R ²	CR	AVE	
Social Pressure (SP) Daniel. (2016) Hebaz <i>et al.</i> (2024) Constantin and Antony Paulraj (2012)	Natural Capital	0.68	0.50	0.82	0.53	
	Regulations	0.77	0.60			
	Customer pressure	0.73	0.53			
	Global Competitiveness	0.70	0.50			
White Supply Chain Management (WSCM) Jonauskaite <i>et al.</i> (2020) Kanagaraj <i>et al.</i> (2020) Thongchua (2005)	Green Supply Chain Management	0.82	0.67	0.82	0.60	
	Corporate Social Responsibility in Supply Chain Management	0.79	0.63			
	Ethic Supply Chain Management	0.71	0.50			
Green Supply Chain Management (GSCM) Khanal <i>et al.</i> (2023) Hsu and Hu (2008) Sarkis (2014) Bureau of Logistics DPIM (2015) Sibel and Bulent (2019) Thi (2020)	Green Purchasing	0.74	0.54	0.87	0.58	
	Green Manufacturing	0.72	0.52			
	Green Distribution	0.72	0.52			
	Internal Environmental Management	0.72	0.52			
	Investment Recovery	0.90	0.82			
Corporate Social Responsibility in Supply Chain Management (CSCM) Zhang and Huang (2024) Hutchins and Sutherland (2008) Urbaniak (2015)	Safety Responsibilities	0.94	0.88	0.94	0.90	
	Economic Responsibilities	0.95	0.91			
Ethic Supply Chain Management (ESCM) Supaporn (2001) SCMA (2014) Yusuf <i>et al.</i> (2014)	Honesty	0.60	0.53	0.78	0.57	
	Justice	0.76	0.57			
	Respect the Rights	0.79	0.62			
Sustainable Performance (SUS) Sadaat and Stefan (2015) Jaffar <i>et al.</i> (2019)	People Performance	0.81	0.66	0.81	0.59	
	Profit Performance	0.77	0.60			
	Planet Performance	0.72	0.52			

Table 2. Assessment of model fit

Absolute fit index	χ^2/df	GFI	AGFI	CFI	TLI	RMSEA	RMR
Acceptance criteria	≤ 3	≥ 0.90	≥ 0.90	≥ 0.90	≥ 0.90	≤ 0.08	≤ 0.05
Model	1.233	0.926	0.917	0.965	0.962	0.019	0.025

Table 3. Summary of path coefficients of all hypotheses

Hypothesis	β	Type	Result
H2: SP→WSCM	0.61***	Direct	Supported
H3: WSCM →SUS	0.45***	Mediation	Supported
H4: SP→SUS	0.64***	Direct	Supported

Figure 1. Proposed conceptual model

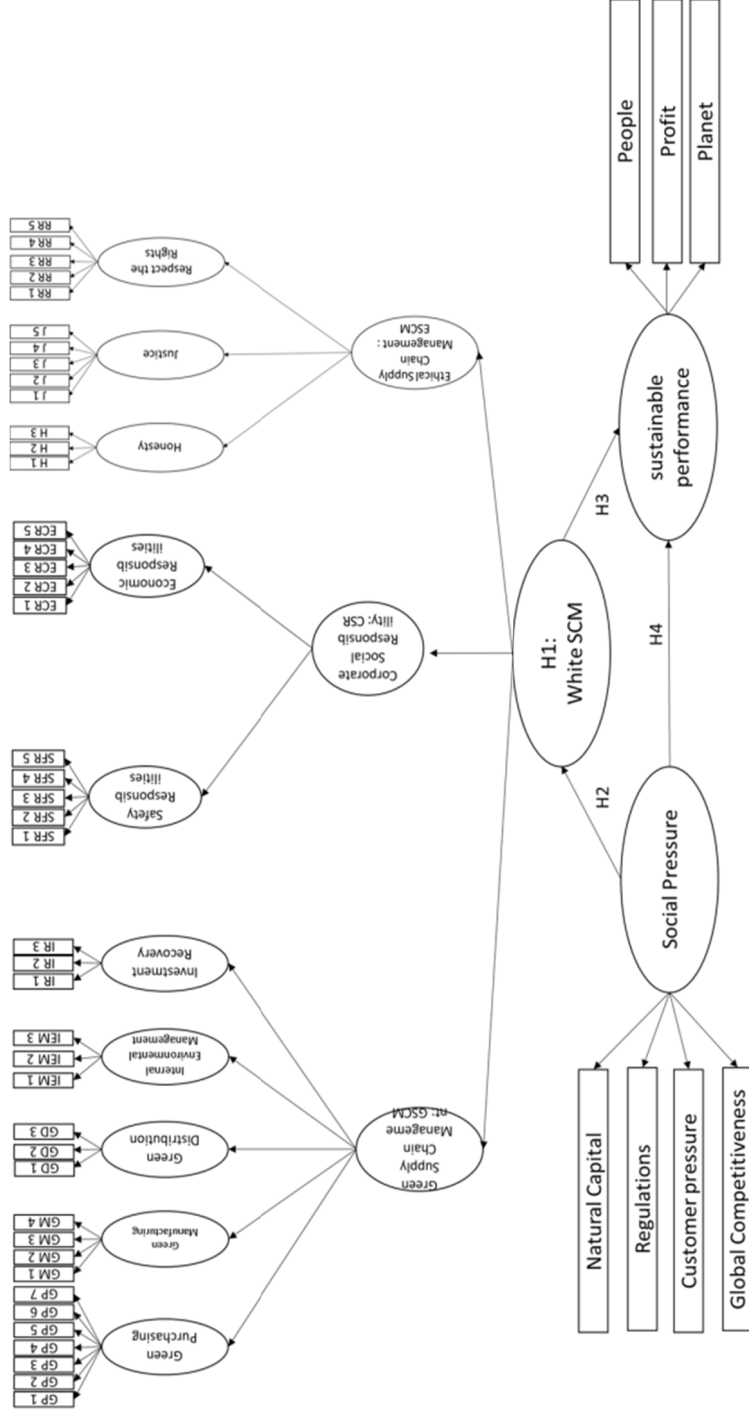
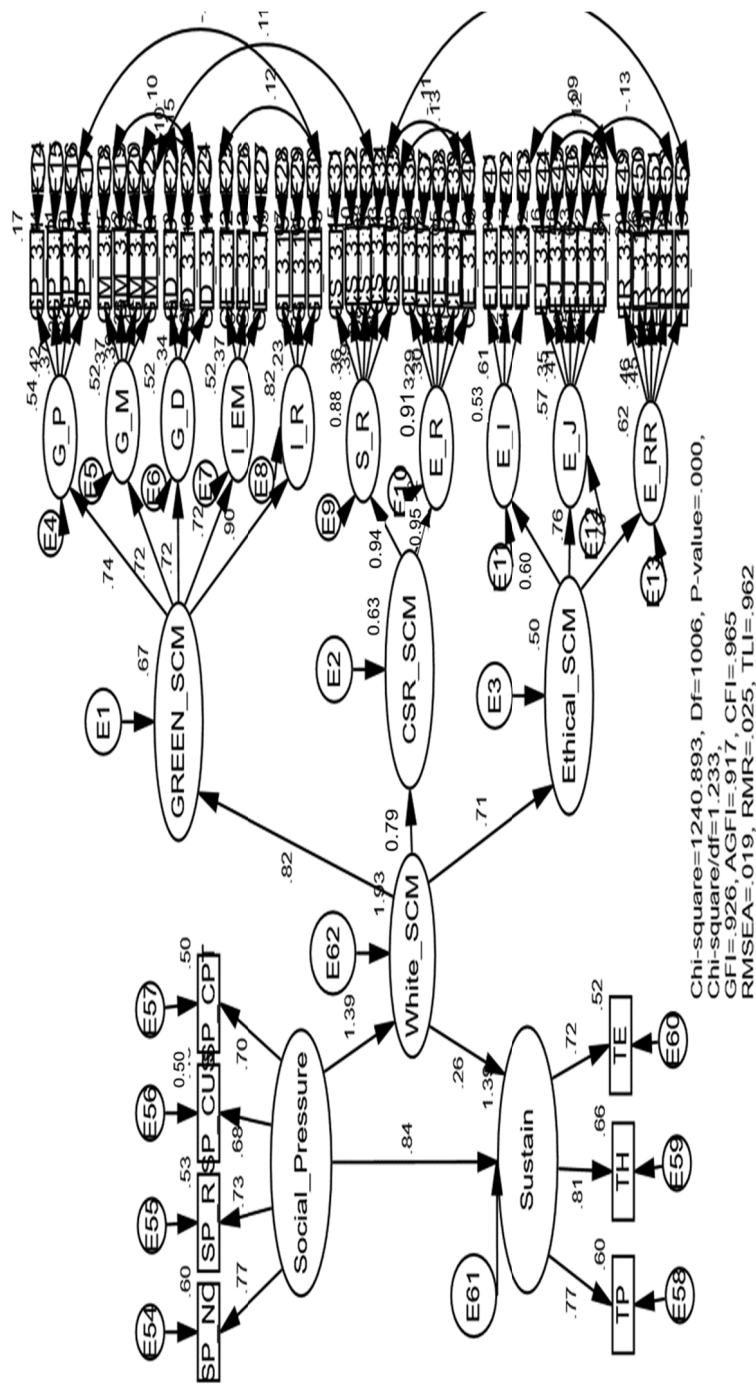


Figure 2. Construct, dimension, items, and CFA standardized loading



Appendix

Questionnaire

Subject: The Model of White Supply Chain Management for Sustainable Performance in Food Industry

This questionnaire consists of 60 questions divided into 4 parts as follows:

Part 1: Basic information of the respondents

Part 2: Information about social pressures

Part 3: Information about white supply chain management

Part 4: Information about sustainable operations

Notation

1) Ask the respondents to answer every questionnaire according to your opinions and be as truthful as possible. The information answered will be kept confidential. The results will be analyzed overall, no disclosure of information and this information will be used for research purposes only.

2) This questionnaire is a research tool which has the following objectives to answer the questionnaire.

1. To analyze the factors in the supply chain that affect sustainable performance in the Food Industry with environmental and ethical awareness.
2. To analyze the validity components of white supply chain management in the Food Industry.
3. To study the impact of white supply chain management on sustainable performance of the Food Industry.

Part 1: Basic information of the respondents

Explanation: Please mark / into ☐ that corresponds to your information as it actually is.

1. Sex

☐ Male

☐ Female

2. Age

☐ < 24 years

☐ 24 – 40 years

☐ 41 – 55 years

☐ 56 – 74 years

☐ 75 – 102 years

3. Highest education

☐ Under bachelor's degree

☐ Bachelor's degree

☐ Postgraduate

4. Department

☐ Production Department

☐ Planning Department

☐ Quality Control Department

☐ Design and Development Department

☐ Marketing Department

☐ Human Resources Department

☐ Procurement Department

☐ Accounting Department

☐ Finance Department

☐ Other (Please specify).....

5. Jobs Experience Years

6. Monthly Income Baht

Part 2: Information about social pressures

The level of response to the company's social pressure means the influence received from the social environment that affects the organization's operations, causing the organization to adapt themselves operate to the environment. Social pressures include natural capital, environmental regulations, customer pressure and global competitiveness.

No.	Item	the level of response to the company's social pressure						
Natural Capital								
1.	The Company's operations are aware of the environment due to natural disasters.	low	1	2	3	4	5	high
2.	The Company's operations are environmentally conscious because of the scarcity of natural resources.	low	1	2	3	4	5	high
3.	The company has been operating for environmental restoration.	low	1	2	3	4	5	high
Environmental Regulations								
4.	The company operates in accordance with environmental regulations.	low	1	2	3	4	5	high
5.	The company has research and development to operate in accordance with environmental regulations.	low	1	2	3	4	5	high
6.	The company is willing to invest in ensuring its operations comply with environmental regulations.	low	1	2	3	4	5	high
Customer Pressure								
7.	The company produces products that are environmentally friendly because it meets the needs of customers.	low	1	2	3	4	5	high
8.	The company chooses raw materials that are environmentally friendly because it meets the needs of customers.	low	1	2	3	4	5	high
9.	The company is aware of the environment in the transportation of raw materials and products because it is the customer's need.	low	1	2	3	4	5	high
Global Competitiveness								
10.	The company has improved the process of recognizing the environment in order to increase their ability to compete globally.	low	1	2	3	4	5	high
11.	The company's research and product development is environmentally conscious to enhance global competitiveness.	low	1	2	3	4	5	high
12.	The company is willing to invest in environmental-related activities to enhance its global competitiveness.	low	1	2	3	4	5	high

Part 3: Information about white supply chain management

The importance of white supply chain management for a company means that the company operates with more or less consideration for white supply chain management. If a company operates with more white supply chain management in mind, it means it places a high priority, and less consideration means less importance. White supply chain management consists of green supply chain management social responsibility and ethics.

No.	Item	The importance of white supply chain management for a company						
Green Supply Chain Management: Green Purchasing								
1.	The company has purchased materials or products that are environmentally friendly.	low	1	2	3	4	5	high
2.	The company selects suppliers that are certified for the sale of environmentally friendly raw materials or products.	low	1	2	3	4	5	high
3.	The company has a sustainable procurement policy.	low	1	2	3	4	5	high
4.	The company has an environmental audit and assessment of its suppliers.	low	1	2	3	4	5	high
5.	The company has environmental criteria for selecting suppliers.	low	1	2	3	4	5	high
6.	Companies and suppliers work together to develop environmentally friendly technologies and processes.	low	1	2	3	4	5	high
7.	The company encourages suppliers to have a production process that does not affect the environment from the beginning of production, transportation, use, to disposal of the raw materials or products.	low	1	2	3	4	5	high
Green Supply Chain Management: Green Production								
8.	The company established an environmental risk management system.	low	1	2	3	4	5	high
9.	The company builds a database of environmental products.	low	1	2	3	4	5	high
10.	The Company's manufacturing processes are environmentally friendly.	low	1	2	3	4	5	high
11.	The company has management system planning and factory maintenance from procurement, inventory, production, sales, and taking care of employees to be socially and environmentally responsible.	low	1	2	3	4	5	high
12.	The company designs and builds packaging for products made from materials that are environmentally friendly recycled or natural materials.	low	1	2	3	4	5	high
Green Supply Chain Management: Green Distribution								
13.	The company develops transportation to minimize greenhouse gas emissions.	low	1	2	3	4	5	high
14.	Companies reduce energy consumption and the impact on the environment.	low	1	2	3	4	5	high
15.	The company cooperates with customers to use green packaging.	low	1	2	3	4	5	high
16.	The company has reformed the logistics and transportation system.	low	1	2	3	4	5	high

No.	Item		The importance of white supply chain management for a company					
			1	2	3	4	5	
17.	The company tracks and monitors the emissions generated by product distribution.	low						high
Green Supply Chain Management: Internal Environmental Management								
18.	The company operates in-house environmentally friendly areas such as Lean and Green, Total Quality Environmental Management: TQEM, Inventory Management, Material Substitution and Process Modification.	low						high
19.	The company processes transactions and communicates via the Internet instead of documents.	low						high
20.	Senior and mid-level managers cooperate in supporting environmental practices.	low						high
21.	The company has environmental objectives and policies.	low						high
22.	Within companies, between departments work together to improve the environment.	low						high
23.	The company established an environmental management system.	low						high
Green Supply Chain Management: Investment Recovery								
24.	Raw materials and products purchased from suppliers can be reclaimed, reused, remanufactured and recycle.	low						high
25.	The company has established a recycling system for used and defective goods.	low						high
26.	The company solved the investment problem by taking out inventory or raw materials for sale.	low						high
Social Responsibility: Safety								
1.	The product must be safe	low						high
2.	In the case of food there is a traceability system.	low						high
3.	The company concentrates on safety transportation.	low						high
4.	The company discloses information to the public.	low						high
5.	The company has a system to prevent accidents at work, such as maintaining a safe workplace, preventing accidents and occupational diseases.	low						high
6.	The company promotes the health and safety of employees.	low						high
7.	The company responds appropriately to accidents and losses.	low						high
Social Responsibility: Economic								
8.	The Company participates in economic development within the community.	low						high
9.	The company is legally and financially stable and has reliable information dissemination. (such as financial annual reports, issuance of new shares/bonds, change of ownership structure)	low						high

No.	Item		The importance of white supply chain management for a company					
			1	2	3	4	5	
10.	The company makes customers satisfied with products and services that are worthwhile.	low	1	2	3	4	5	high
11.	The company distributes fair returns to investors.	low	1	2	3	4	5	high
12.	The company distributes its economic benefits according to the functions of its citizens. (by taxation and reasonable product prices)	low	1	2	3	4	5	high
Social Responsibility: Environment								
13.	The company has compensation for damages such as reducing energy consumption and reforestation.	low	1	2	3	4	5	high
14.	The company regulates the hazardous chemicals that are part of their products.	low	1	2	3	4	5	high
15.	The company has eliminated harmful substances from the production process such as mercury, lead, and cadmium.	low	1	2	3	4	5	high
16.	The company has reduced environmental pollution.	low	1	2	3	4	5	high
Ethics: Honesty								
1.	Building a good relationship with everyone in the company with honesty	low	1	2	3	4	5	high
2.	Building a good relationship with the outside of the company with honesty	low	1	2	3	4	5	high
3.	Prohibition of bribery, corruption, extortion, embezzlement	low	1	2	3	4	5	high
Ethics: Justice								
4.	Non-discrimination	low	1	2	3	4	5	high
5.	Creating quality products and providing services worth the price	low	1	2	3	4	5	high
6.	Setting reasonable prices for goods and services	low	1	2	3	4	5	high
7.	Fair business competition	low	1	2	3	4	5	high
8.	Conduct business with fairness	low	1	2	3	4	5	high
9.	Price collusion	low	1	2	3	4	5	high
Ethics: Respect the Right								
10.	Considering the interests and rights of others	low	1	2	3	4	5	high
11.	Health and safety of employees in the workplace	low	1	2	3	4	5	high
12.	Non-violation of human rights protection of labor rights	low	1	2	3	4	5	high
13.	Confidentiality of employee personal information and protection of the identity of the supplier	low	1	2	3	4	5	high
14.	Respecting Intellectual Property	low	1	2	3	4	5	high

Part 4: Information about sustainable operations

The level of sustainable performance that occurs within the company means: The results of the company's sustainable operations include economic, social and environmental performance

No.	Item	The level of sustainable performance that occurs within the company						
Economic Performance								
1.	Reduce the cost of materials purchased	low	1	2	3	4	5	high
2.	Reduce energy consumption	low	1	2	3	4	5	high
3.	Reduce cost of eliminating pollution	low	1	2	3	4	5	high
4.	Earnings per share increase	low	1	2	3	4	5	high
5.	Return on investment increase	low	1	2	3	4	5	high
6.	Sales increase	low	1	2	3	4	5	high
7.	Profit increase	low	1	2	3	4	5	high
Social Performance								
8.	Customer satisfaction increase	low	1	2	3	4	5	high
9.	Customer images improve	low	1	2	3	4	5	high
10.	Social projects investment increase (education, culture and sports)	low	1	2	3	4	5	high
11.	Stakeholders' community relationship improves	low	1	2	3	4	5	high
12.	Awareness and protection of the rights people in community increase	low	1	2	3	4	5	high
13.	Employees' knowledge increase (Training)	low	1	2	3	4	5	high
14.	Employees occupational health and safety increase	low	1	2	3	4	5	high
15.	Stakeholders benefit increase	low	1	2	3	4	5	high
Environmental Performance								
16.	Company environments improve	low	1	2	3	4	5	high
17.	Wastewater discharged reduce	low	1	2	3	4	5	high
18.	Air pollution emissions decrease	low	1	2	3	4	5	high
19.	Hazardous materials exposure reduces (toxic)	low	1	2	3	4	5	high
20.	Environmental accidents frequency reduces	low	1	2	3	4	5	high