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Influence of Green Supply Chain Management on Business Performance of Vietnamese Electronic Firms

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ABSTRACT

The study's objective is to assess the influence of green supply chain management (GSCM) on business performance of Vietnamese electronic firms by testing multivariate regression model through software SPSS. The study was completed based on survey results of 961 electronic firms and combined with interview results obtained from the directors, the deputy directors, and other positions directly involved in the supply chain management system. The results show that GSCM has a direct positive impact on business performance and has an indirect positive impact on business performance through employee job satisfaction, operational efficiency, relational efficiency. This study provides some valuable implications for electronic firms in raising their awareness and also developing their green supply chain management system.

Keywords: GSCM, Green supply chain management, Business performance, Vietnamese electronic firms.

1. INTRODUCTION

Over the past few decades, rapid industrialization and modernization have resulted in negative environmental impacts including greenhouse gas emissions, climate change and depletion of natural resources. Among the fields, electronics is identified as one of the areas with great potential to limit climate change and natural resource depletion. It is because according to a report by the Waste Electrical and Electronic Equipment Forum (WEEE Forum), the global amount of e-waste in 2021 weighs about 57 million tons, larger than the volume of the Great Wall of China. Despite such a large amount of e-waste, so far, only about 18% of it has been collected and recycled, with the rest sent to landfills, incinerated or simply not treated. Therefore, "greening" the electronics industry has become very necessary to ensure the survival of the next generation.

Green supply chain management is a globalization trend that concerns all countries. Despite this, most research has been conducted in the developed countries, while in emerging economies it has received less attention. Joseph (2012) believes that differences in countries and industries will determine the extent to which green supply chain management practices affect business performance. Previous studies have mainly examined the effects of green supply chain management on environmental outcomes, ignoring economic and social outcomes (*Tam et al.*, 2006; *Gangolells et al.*, 2009;

Chen, Okudan and Riley, 2010; *Fernández-Sánchez and Rodríguez López*, 2010). Therefore, there is a need for more studies on the relationship between green supply chain management and business performance in all three sustainability pillars (including economic, environmental and social).

Another problem that still exists is that few studies investigate how the relationship between enterprises and members of the supply chain affects business performance. In addition, the influence of electronic business characteristics has not been fully mentioned in previous studies. Knowledge of the differences between businesses is necessary for the formulation of strategies and policy changes to support businesses that are lagging behind others.

In Vietnam, green supply chain management in electronics industry is existing in the form of a relatively new concept and needs to be further researched. This leads to a question: How GSCM influences business performance of Vietnamese electronic firms?

To answer this question, the authors conducted a study on the influence of green supply chain management on business performance of Vietnamese electronic firms. The article is divided into 5 parts: (i) Introduction, (ii) Research overview and theoretical basis, (iii) Research methodology, (iv) Research results and discussion, (v) Conclusion.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1. Literature overview

Many literatures demonstrate a positive correlation between green supply chain management and business performance. De Giovanni (2012) argues that green supply chain management is not only a tool to reduce the environmental impact of products and activities, but also a strategy to achieve economic benefits and improve social benefit.

Rao (2002) surveyed 52 manufacturing companies in the Philippines, Malaysia, Indonesia, Thailand and Singapore about greening their supply chains. Experts use exploratory methods and confirmatory factor analysis. They ultimately concluded that there is a strong link between environmental initiatives and environmental performance.

Zhu and Sarkis (2004) study the relationship between green supply chain management (including internal environmental management, external operations, return on investment and eco-design) and firm performance (including environmental and economic results) of the pioneers in this field in China. The authors surveyed 186 companies combined with factor analysis and multivariate regression analysis to find that companies which are more likely to adopt green supply chain management practices achieve better economic and environmental results. This conclusion was confirmed again by Zhu et al (2007). He said the degree to which green supply chain management practices are implemented is positively correlated with the level of effectiveness achieved.

In a similar context, Liang and Chang (2008) surveyed 127 SMEs in China to explore the potential impact of green supply chain management on their operations. Using a structural equation model, the authors find that SME performance is positively affected by the adoption of green supply chain management.

104 messages related to green supply chain management were analyzed in the study by Bose and Pal (2012). They find that companies that adopt environmentally sound management practices in their supply chains have a positive impact on shareholder value.

Geng et al. (2016) also show that green supply chain management practices lead to better outcomes. Specifically, the effect of green supply chain management practices is highest on economic outcomes, followed by environmental outcomes. In the context of globalization, this adoption to improve business efficiency becomes increasingly necessary as supply chains become more

and more complex.

Laari (2016) found that while internal green supply chain management practices had the greatest impact on environmental outcomes, both environmental cooperation with customers and environmental cooperation with suppliers had the greatest direct impact and significant financial implications.

Liu and Chang (2017) used structural equation modeling for the analysis of 296 Chinese manufacturers. The authors found that green supply chain management positively impacts both the economic and environmental outcomes of companies.

Zaid et al (2018) examine the links between green human resource management and green supply chain management as well as their influence on sustainable operations (environmental, social and economic aspects). A quantitative approach was used to collect data from a survey of 121 companies operating in the most polluting manufacturing sectors of Palestine (food, chemicals and pharmaceuticals). The team demonstrates that internal green supply chain management practices have a positive effect on environmental, economic and social outcomes. In fact, there is a correlation between green activities in the company and increased efficiency in the use of inputs and assets (*Schmidheiny*, 1992), leading to cost savings through initiatives, recycling products and save energy (*Zhu and Sarkis*, 2004; *Zhu et al.*, 2005), and reducing waste *(Kitazawa and Sarkis*, 2000). Furthermore, these activities help to improve the company's image to its stakeholders (employees, suppliers, customers, authorities, etc.) (*Abdullah et al.*, 2015). In addition, having this positive image gives the company many social benefits such as improving employee morale and increasing customer loyalty or satisfaction (*Eltayeb et al.*, 2011). One limitation found in this study is that all manufacturing companies are located in the same country (Palestine), so the legal environment, national culture and institutional background can influence to the relationship between the two countries, reducing the lack of generalizability.

From the inheritance of the achievements of previous studies and based on research gaps, the authors have proposed a research direction on the influence of green supply chain management on business performance of Vietnamese electronic firms through building a model, which assess the impact of GSCM on business performance based on both direct and indirect impacts, indirect effects are built through mediating variables: Employee job satisfaction, operational efficiency and relational efficiency.

2.2. Theoretical framework

2.2.1. Green supply chain management (GSCM)

Green supply chain management is associated with the management of its links including green design, green operation which involves green purchasing, green input and output logistics, reverse logistics, waste management, and green production (*Guide and Srivastava*, 1998; *Srivastava*, 2007).

Green supply chain management is derived from both environmental management and supply chain management literature. Adding the 'green' component to supply chain management is about addressing the relationship between supply chain management and physical environment. Green design has been widely used in literature to denote products designed with certain environmental considerations in mind. It is the systematic review of design issues related to environmental health and safety throughout the entire product life cycle during new process development and production (*Fiksel*, 1996). Its scope covers many areas: environmental risk management, product safety, occupational health and safety, pollution prevention, resource conservation and waste management. Green activity involves all aspects related to product production/ reproduction, use, disposal, logistics and waste management after the design has been

finalized. Green manufacturing aims to reduce the ecological burden by using appropriate materials and technology, while remanufacturing refers to an industrial process in which worn out products are restored to be new (*Lund*, 1984).

Thus, it can be generalized that green supply chain management is the integration of environmental management functions into inter-organizational activities, specifically including: suppliers, businesses and customers.

2.2.2. Business Performance

2.2.2.1. Definition

Business performance can be defined by the relationship between the amount of money that the business spends and the results obtained after the entire period of organization, operation, and performance, making use of resources in the process of operation, ignoring the reflection correlation of other factors. Unlike results - showing revenue, benefits, and value over a long period of time of operation, efficiency here represents the level of exploitation and utilization of available resources.

2.2.2.2. Factors to measure the performance of the business

To measure the business performance, researchers can use a variety of measurement tools, for example, for accounting ratios, researchers often prefer to use the profit value coefficients such as ROS, ROA, ROE, or basic indicators, used as a scale for the frequency of utilization and optimization of labor resources such as labor efficiency, employee loyalty, and engagement or the level of satisfaction of third parties such as partners, customers.

Researchers use the following factors as a scale for the efficiency of the business:

(1) Based on income from financial activities

(2) Based on income from business activities

(3) Based on the extent to which social and environmental needs are met and satisfied

2.2.3. Employee job satisfaction, operational efficiency and relational efficiency

2.2.3.1. Employee job satisfaction

Previous researchers have defined job satisfaction in different ways. Spector (1997) refers to job satisfaction as how people feel about their job and different aspects of that job. Ellickson and Logsdon (2002) define job satisfaction as the degree to which employees enjoy their jobs. Schermerhorn (1993) suggested that job satisfaction is an affective or emotional response to different aspects of an employee's job. Based on Maslow's theory, job satisfaction has been approached by some researchers from the perspective of needs fulfillment (*Kuhlen*, 1963; *Worf*, 1970; *Conrad et al.*, 1985).

Job satisfaction and dissatisfaction depends not only on the nature of the job but also on the expectations about what the job provides to employees (*Hussami*, 2008). Lower costs, higher rewards increase job satisfaction (*Mendinge and Mullier*, 1998; *Willem et al.*, 2007). Job satisfaction is a complex phenomenon with many facets (*Fisher and Locke*, 1992; *Xie and Johns*, 2000); it is influenced by factors such as wages, working environment, autonomy, communication and corporate commitment (*Lane, Esser, Holte and Anne*, 2010; *Vidal, Valle and Aragón*, 2007; *Fisher and Locke*, 1992; X*ie and Johns*, 2000).

2.2.3.2. Operational efficiency

Currently, in the world, there are still quite a few topics related to operational efficiency. Operational efficiency is associated with cost and time savings while still providing short-term benefits (*Kaplan and Norton*, 2001). Operational efficiency reflects the ratio of outputs to inputs in the value creation process (*Madhavan and Grover*, 1998; *Priem and Butler*, 2001), which includes two aspects: cost-based efficiency and time-based efficiency. While cost-based efficiency is related to "quality costs, engineering change costs, and manufacturing costs," time-based efficiency

is "speed and reliability of the process." delivery, lead time and inventory turnover" (*Yeung*, 2008). However, managers also run the risk of overemphasizing operational performance at the expense of strategic flexibility. This imbalance can be caused by stakeholder pressures or measurement structures, and can lead to a focus on short-term profits instead of long-term adaptability (*Doyle*, 1992; *George and Van de Ven*, 2001; *Kaplan and Norton*, 2001). Thus, operational efficiency – similar to strategic flexibility – is "a necessary, but not sufficient, condition for maintaining competitive advantage" (*Krause et al.*, 2013).

2.2.3.3. Relational efficiency

Until now, the definition of relational efficiency is still very vague because there is very little research related to this topic. Relational efficiency focuses on those activities that enhance service firms' proximity to customers, so that companies can understand customer needs and expectations, and develop processes to respond to them (*Stank, Goldsby, and Vickery*, 1999). Relational efficiency is one of the main antecedents of customer loyalty (*Vickery et al.*, 2004).

2.2.4. The relationship between green supply chain management and business performance

2.2.4.1. Green supply chain management influences through employee job satisfaction

Several previous studies have concluded that employees on the production line feel safer and more satisfied with their work environment when hazardous materials are removed from the production process. Applying GSCM and TQM creates the same working environment and leads to similar outputs. GSCM practice and employee satisfaction may have a positive relationship similar to that observed between TQM adoption and employee job satisfaction (Jun et al., 2006).

Job satisfaction is a measure of employee satisfaction – a factor that leads to better job performance (Edwards et al., 2008). Harrison et al. (2006) found that work attitude, including job satisfaction and company commitment, is a strong antecedent of organizational behavior and employee performance based on aggregate integration. In addition, Zhou et al (2008) provide evidence in Chinese manufacturing companies that firm performance is positively correlated with employee job satisfaction.

2.2.4.2. Green supply chain management influences through operational efficiency

Previous studies have shown that the world's leading businesses, such as Samsung and LG Electronics, have operated more efficiently in all aspects since they implemented GSCM (Lee, 2007). Zacharia et al (2009) examined whether business performance is significantly correlated with operational performance. The results show that this is a positive and statistically significant relationship.

2.2.4.3. Green supply chain management influences relational efficiency

Manuj and Mentzer (2008) argue that risks in the global supply chain occur when the supply chain expands containing a number of potential threats. Many of the original supply chain problems will continue to exist in the global supply chain. Not only that, difficulties related to product quality, inventory control, and buyer-supplier trust can be amplified by new risk factors - distance, language, and cultural differences in addition to supply chain disruptions due to unforeseen natural disasters. From the resource-based perspective, purchasing firms secure input flows by forming long-term and stable relationships with international suppliers (*Pfeffer and Salancik*, 1978; *Kaufmann and Carter*, 2006). Since companies depend on partners for the necessary inputs, establishing good business relationships has become the key to reducing environmental uncertainty (*Pfeffer*

and Salancik, 1978; *Ketchen and Hult*, 2007).

2.2.5. Research theories

2.2.5.1. The relationship between green supply chain management and business performance

Khanna and Anton (2002) believe that environmental management is a business approach not only to protect the environment but also to incorporate environmental considerations into strategic decisions of businesses. The experimental results of this study emphasize the importance of environmental management, which is a cost-effective proposition in the long run (*Klassen and Whybark*, 1999; *Madsen and Ulhøi*, 2003). Otherwise, compliance with the restrictions leads to high costs and public pressure on the business. Furthermore, companies that apply environmental management or GSCM are considered socially responsible businesses (*Borger and Kruglianskas*, 2006; *Montiel*, 2008; *Cruz and Pedrozo*, 2009). Therefore, the authors propose the following hypothesis:

H1: Green supply chain management has a positive effect on business performance.

2.2.5.2. The relationship between green supply chain management and employee job satisfaction.

The adoption of green practices is believed to improve the working conditions of employees and local communities, where people can enjoy healthier lives (*Rani and Mishra*, 2014). In particular, the implementation of environmentally-oriented and low-pollution production practices has a positive impact on the social aspects of employees, as suggested by Elkington (2004). Therefore, the authors propose the following hypothesis:

H2: Green supply chain management has a positive effect on employee job satisfaction.

2.2.5.3. The relationship between employee job satisfaction and business performance

Ostroff (1992) found that businesses that get satisfaction from more employees tend to operate more efficiently than businesses that do not. Ryan, Schmitt, and Johnson (1996) have found that employee morale is related to business performance metrics, customer satisfaction, and sales ratios. Harter et al. (2002) found a positive correlation between employee satisfaction and firm performance as measured by productivity, profitability, employee turnover, employee accidents, and customer satisfaction. Gould-Williams (2003) suggests that when employees act diligently and have outstanding performance, organizational performance will be superior. Schneider et al (2003) found that return on assets (ROA) and earnings per share are positively correlated with job satisfaction. Therefore, the authors propose the following hypothesis:

H3: Employee job satisfaction has a positive effect on business performance.

2.2.5.4. The relationship between green supply chain management and operational efficiency

Previous studies have shown that applying GSCM inside a business, such as integrating environmental management systems and employee engagement, can improve operational efficiency (*Hanna et al.*, 2006). Producing an environmentally friendly material has been shown to produce a product that is safer and less expensive, with higher quality, more stability, and greater scrap value (*Porter et al. Van der Linde*, 1995; *Sarkis*, 2001). Therefore, the authors propose the following hypothesis:

H4: Green supply chain management has a positive effect on operational efficiency.

2.2.5.5. The relationship between operational efficiency and business performance

There is little empirical evidence on the effect of operational efficiency on business performance. Berman et al. (1999) have shown that businesses that have cost

leadership qualities (measured through cost-effectiveness, defined as the ratio of cost of goods sold to total sales, with a lower value indicating higher operating efficiency) achieve better financial performance. Using case studies, Triebswetter and Hitchens (2005) found that high-productivity factories took on more environmental initiatives than low-productivity firms. Therefore, the authors propose the following hypothesis:

H5: Operational efficiency has a positive effect on business performance.

2.2.5.6. The relationship between green supply chain management and relational efficiency

The more cooperative efforts of the purchasing business and the supplier in the implementation of GSCM, the higher the level of trust, reputation, and effectiveness of the relationship between the parties (*Lamming and Hampson*, 1996; *Simpson et al.*, 2007; *Ryu; et al*., 2009; *Zacharia et al.*, 2009). Therefore, the authors propose the following hypothesis:

H6: Green supply chain management has a positive effect on relational efficiency.

2.2.5.7. The relationship between relational efficiency and business performance

According to some previous studies, if an organization successfully increases the output from a relationship, the more the organization values that relationship (*Pfeffer and Salancik,* 1978). It is suggested that trust should be a "precondition" for the success of the collaboration between organizations in the supply chain (*Sahay*, 2003; *Ryu et al.*, 2009; *Fawcett et al.*, 2009). A higher level of trust between organizations in the supply chain helps to smoothly set goals and plans, improve product quality, and create greater customer value (*Monczka et al.*, 1998; *Wong et al.*, 2005). Furthermore, some researchers show that long-term, well-established relationships between buyers and suppliers help suppliers improve their operational efficiency (*Kaufmann and Carter*, 2006; *Liao*, 2010; *Rhee et al.*, 2011). Therefore, the authors propose the following hypothesis:

H7: Relational efficiency has a positive effect on business performance.

2.2.5.8. The relationship between employee job satisfaction and business performance

Schlesinger (1982) found that satisfied employees provide better service than dissatisfied employees. In addition, several studies have demonstrated that satisfied employees are more effective at their jobs (*C. Lee & Way*, 2010; *McNeese-Smith*, 1997; *Rafaeli*, 1989; *Spinelli & Canavos*, 2000). Therefore, the authors propose the following hypothesis:

H8: Employee job satisfaction has a positive effect on business performance.

2.2.5.9. The relationship between operational efficiency and relational efficiency

Zacharia et al. (2009) argue that a business can gain more trust and credibility from its partners when the business demonstrates its operational excellence and the effectiveness of the relationship will be enhanced when the partner company consistently achieves success in their joint endeavors. Thus, relational performance can also be affected by operational performance (*Zacharia et al.*, 2009). Therefore, the authors propose the following hypothesis:

H9: Operational efficiency has a positive effect on relational efficiency.

2.2.6. Model recommendation

Based on the research model of Sang M. Lee, Sung Tae Kim, and Donghyun Choi (2012), the authors build a new model to determine the degree of influence of green supply chain management on business performance.

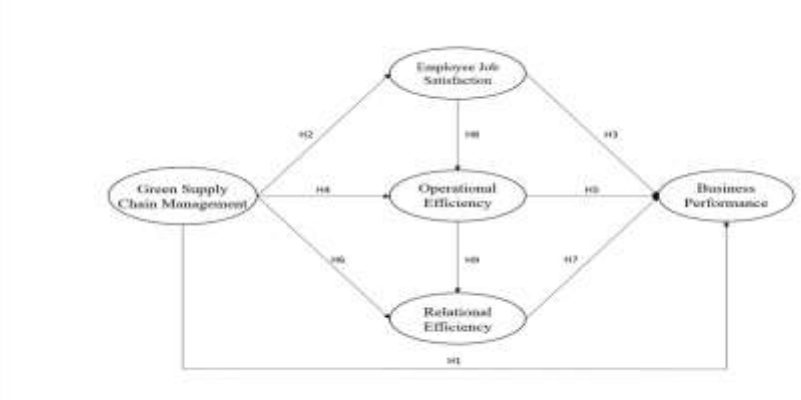

Figure 1: Proposal research model
(Source: Synthesized by research team based on the research models of Sang M. Lee, Sung Tae Kim, and Donghyun Choi)

3. RESEARCH METHOD

3.1. Methods of data collection and study samples

3.1.1. Data collection

The authors collect primary data for quantitative research through two methods: direct and indirect. The direct method is implemented by giving the questionnaire directly to the survey takers. In addition, the authors collect data through indirect methods through phone calls, postal ballots, online surveys using the Google Docs application, and sending the questionnaire link to businesses via email.

Respondents to these questions are members of the Board of Directors, other leadership positions and the department's managers. They have knowledge or practical experience in green supply chain management.

In addition, a valid answer sheet is the sheet completing all content in the questionnaire, one question only has one answer and one answer sheet corresponds to one participating enterprise. At the same time, taking notice to limit the situation that one business returns more than one response. Thus, the problem of variance from one source is limited, the objectivity of the data is guaranteed.

3.1.2. Building a quantitative research sample

The sample construction in quantitative research is very important because the model will not be reliable if the sample size is not large enough. The minimum sample size to be achieved according to Gorsuch (1983) and Kline (1979) is 100. Meanwhile, Cattell (1978) suggests that the sample size should be 3 to 6 times the number of observed variables. Comrey and Lee (1992) gave a standard scale for sample size in factor analysis including: 100 – acceptable, 200 – moderate, 300 – good, 500 – very good, greater than or equal to 1000 – excellent. Based on these grounds, the authors decided to use a sample size of 961.

Table 1: Structure of observations of the study sample

	Background Information	Percentage (%)
Position of surveyee	Director	18.2
	Deputy Director	31.8
	Others	50.0
Experience	< 5 years	12.1
	5 – 10 years	50.4
	11 – 15 years	29.1
	> 15 years	8.4
Size	< 50 employees	7.3
	50 – 100 employees	33.0
	101 – 200 employees	37.5
	201 – 300 employees	16.9
	> 300 employees	5.3
Type	Private company	44.0
	Public company	28.9
	Company having FDI	26.7
	Others	0.4

Table 1 To Be Continued…		
Objective	First-tier supplier	49.4
	Second-tier supplier	25.5
	Supplier for Government	20.5
	Others	4.6

(Source: Synthesized by research team)

3.2. Scale and model concepts

In order to match the model and research objectives, the authors develop the scale according to the following steps: (1) Overview of related studies; (2) Qualitative research; (3) Preliminary research on Vietnamese electronics field; (4) Completing the scale to serve the official quantitative research process.

The authors summarize the scales according to the variables and the origin of the scale as follows:

Table 2: Summary of research variables, indicators, scales and origins

	Observed variables	**Scale**	**Sources**	**Encryption**
Internal environmental management	Senior managers' commitment on GSCM	The 5-point Likert scale, from level 1 (not considering it) to level 5 (currently implementing)	Zhu et al. (2008)	IEM1
	Mid-level managers' support of GSCM			IEM2
	Cross-functional cooperation for environmental improvements			IEM3
	ISO 14001 certification			IEM4
Cooperation with suppliers	Eco labeling of products	The 5-point Likert scale, from level 1 (not considering it) to level 5 (currently implementing)	Chen (2005), Zhu et al. (2008)	CWS1
	Cooperation with suppliers for environmental objectives			CWS2
	Environmental audit for suppliers' internal management			CWS3
	Suppliers' ISO 14000 certification			CWS4
Cooperation with customers	Cooperation with customers for eco-design	The 5-point Likert scale, from level 1 (not considering it) to level 5 (currently implementing)	Hsu and Hu (2008), Zhu et al. (2008)	CWC1
	Cooperation with customers for cleaner production			CWC2
	Cooperation with customers for green packaging			CWC3
	Cooperation with customers for developing environmental database of products			CWC4
Eco-design	Design of products for reduced consumption of material/energy	The 5-point Likert scale, from level 1 (not considering it) to level 5 (currently implementing)	Matos and Hall (2007), Rusinko (2007), Zhu et al. (2008)	ED1
	Design of products for reuse, recycle, recovery of material, component parts			ED2
	Design of products to avoid or reduce use of hazardous products and/or their manufacturing process			ED3
	Design of products for disassembly			ED4
	Design of products considering LCA			ED5
Employee job satisfaction	Most employees like their jobs in the present operations	The 5-point Likert scale, from level 1 (strongly disagree) to level 5 (strongly agree)	Homburg and Stock (2004), Zhou et al. (2008)	EJS1
	Most employees think their supervisor treats them well			EJS2
	Most employees in our firm like their jobs more than many employees of other firms			EJS3
	Most employees in our firm do not intend to work for a different company			EJS4
	Overall, our employees are quite satisfied with their jobs			EJS5
Operational efficiency	Cycle time has been reduced	The 5-point Likert scale, from level 1 (strongly disagree) to level 5 (strongly agree)	Rusinko (2007), Paulraj et al. (2008), Zhu et al. (2008), Zacharia et al. (2009)	OE1
	Overall, costs have been lowered			OE2
	Overall, products' quality has been improved			OE3
	Customer service has been improved			OE4
	Project duration has been reduced			OE5
	Our firm has delivered greater value to our customers			OE6

Table 2 To Be Continued…				
Relational efficiency	An increased respect for the skills and capabilities of customers	The 5-point Likert scale, from level 1 (strongly disagree) to level 5 (strongly agree)	Zacharia et al. (2009)	RE1
	An improved level of honesty			RE2
	More open sharing of information with our customers			RE3
	A more effective working relationship with our customers			RE4
	An enhanced commitment to work with our customers in the future			RE5
	An overall more productive working relationship with our customers			RE6
Business performance	Better asset utilization	The 5-point Likert scale, from level 1 (strongly disagree) to level 5 (strongly agree)	Zhu et al. (2008), Zacharia et al. (2009)	BP1
	Stronger competitive position			BP2
	Improved profitability			BP3
	Overall improved organizational performance			BP4

(Source: Synthesized by research team)

3.3. Data analysis method

This study uses a multivariate regression model, a widely used model in the fields of supply chain management. The authors analyzed the data according to the following steps: testing the reliability of the scale with Cronbach's Alpha coefficients, conducting exploratory factor analysis (EFA), analyzing multivariate regression model, Bootstrap testing for mediating variables.

Step 1: Testing the reliability of the scale: Cronbach's Alpha coefficient indicates the degree of mutual influence of the variables in a questionnaire. According to the research of Nunally and Berndstein (1994), variables whose Cronbach's Alpha coefficient are greater than or equal to 0.6 and have a total correlation coefficient greater than 0.3 will be accepted and included in the next steps:

- Cronbach's Alpha large 0.8: Good
- Cronbach's Alpha from 0.7 to 0.8: Acceptable
- Cronbach's Alpha from 0.6 to 0.7: Acceptable if new scale is applied

Step 2: Exploratory Factor Analysis (EFA): This is the process of selection and elimination of inappropriate factors. During this process, the following criteria should be focused:

- *KMO coefficient (Kaiser-Meyer-Olkin):* KMO coefficient is used to test whether the sample really fits the elements or not. According to Nguyen Dinh Tho, Nguyen Thi Mai Trang (2009), factor analysis is appropriate in the study if the KMO value is greater than or equal to 0.5.
- *Bartlett's test:* Bartlett's test is used to filter out unrelated variables in a model. According to Nguyen Dinh Tho, Nguyen Thi Mai Trang (2009), the value of Sig. of Bartlett's test less than 0.05 is accepted.
- *Eigenvalues:* According to Nguyen Dinh Tho, Nguyen Thi Mai Trang (2009), the condition for a factor to be retained for further analysis is that the Eigenvalue must be greater than or equal to 1.
- *Factor loading coefficient:* Factor loading coefficient shows the degree of correlation between the factor and the observed variable. Observable variables with factor loading coefficients less than 0.5 do not have good statistical significance (Hair et al., 1998). However, according to Nguyen Dinh Tho, Nguyen Thi Mai Trang (2009), researchers should not exclude variables with this coefficient less than 0.5 but the content value plays a big role in the scale. Based on those bases, the authors selected the factor loading coefficient at a level greater than or equal to 0.3.
- *Total variance extracted:* The total variance extracted shows how much the extracted factors are condensed and how much is lost of the observed variables. If the total variance extracted is greater than or equal to 50%, the scale is assessed to be good (Hair et al, 1998).

Step 3: Analyzing multivariable regression model: The authors use 3 tables for the study: Model Summary, ANOVA and Coefficients.

Table Model Summary: In this table, the authors need to pay attention to 2 values: Adjusted R-Square and Durbin-Watson.

- Adjusted R-Square or R-squared shows how much of the independent variables explains the change in the dependent variables. A value of 50% or more is a well-reviewed study.
- Durbin-Watson is used to test the autocorrelation of adjacent errors. This value has a range of 0 to 4; if the error parts have no first order series correlation, the value will be between 1 and 3; the smaller the value (closer to 0), the error parts are positively correlated; the larger the value (closer to 4), the error parts are negatively correlated.

Table ANOVA: The F value in the ANOVA table shows whether this linear regression model is generalizable and applicable to the population. The built linear regression model is suitable for the population if the sig value of the F test is less than 0.05.

Table Coefficients:

- Sig value t-tests of each independent variable: If the sig value is less than or equal to 0.05, the variable is significant in the model, if sig is greater than 0.05, the variable should be removed.
- Standardized regression coefficient (Beta): The independent variable having the largest Beta coefficient has the most influence on the change of the dependent variable. If the Beta coefficient is negative, it means that the variable has a negative effect, and if the Beta coefficient is positive, the variable has a positive effect.
- Variance magnification factor (VIF): Used to check for multicollinearity. If VIF is less than 2, then no multicollinearity occurs.

Step 4: Bootstrap testing for mediating variables

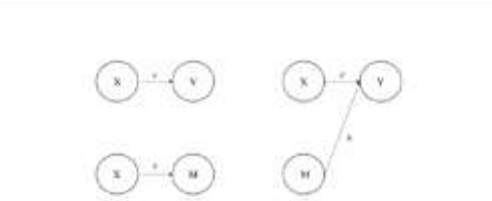

Figure 2: Model for mediating variables
(Source: Synthesized by research team)

X: Independent variable
Y: Dependent variable
M: Mediating variable
c': Direct effect from X to Y
a*b: Indirect effect from X to Y through M
c: Aggregate total effects from X to Y

The authors need to concentrate on the following results:

- Unstandardized beta coefficients of the tested variables and sig values.
- Indirect effect(s) of X on Y: Indirect effect from X on Y through M based on bootstrap confidence interval for product a*b.

If the confidence interval for the bootstrap product of a*b contains the value 0, there is no indirect effect from X on Y. If the confidence interval for the bootstrap product a*b does not contain the value 0, there is an indirect effect from X to Y.

4. RESEARCH RESULT

4.1. Testing the reliability of the scale

The authors use Cronbach's Alpha coefficient and total variable correlation coefficient to test the reliability of the scale. The variables whose Cronbach's Alpha is greater than or equal to 0.6 and do not reduce the group's Cronbach's Alpha, and total variable correlation coefficient is greater than 0.3, will be further processed in the next steps.

Table 3: Results of testing the reliability of the scale

Factors	Variables	Cronbach's Alpha of factors	Cronbach's Alpha of factors if variable is deleted	Item-Total Correlation	The number of deleted variables
IEM	IEM1	0.893	0.880	0.717	0
	IEM2		0.848	0.803	
	IEM3		0.854	0.785	
	IEM4		0.866	0.754	

Table 3 To Be Continued…					
CWS	CWS1	0.839	0.893	0.631	0
	CWS2		0.791	0.681	
	CWS3		0.790	0.685	
	CWS4		0.789	0.687	
CWC	CWC1	0.796	0.761	0.572	0
	CWC2		0.762	0.573	
	CWC3		0.707	0.683	
	CWC4		0.748	0.600	
ED	ED1	0.865	0.835	0.697	0
	ED2		0.824	0.737	
	ED3		0.835	0.697	
	ED4		0.839	0.677	
	ED5		0.852	0.626	
EJS	EJS1	0.916	0.901	0.768	0
	EJS2		0.906	0.741	
	EJS3		0.895	0.793	
	EJS4		0.888	0.829	
	EJS5		0.895	0.793	
OE	OE1	0.909	0.891	0.766	0
	OE2		0.898	0.713	
	OE3		0.888	0.782	
	OE4		0.883	0.813	
	OE5		0.905	0.658	
	OE6		0.892	0.758	
RE	RE1	0.898	0.890	0.652	0
	RE2		0.881	0.714	
	RE3		0.881	0.717	
	RE4		0.866	0.812	
	RE5		0.882	0.708	
	RE6		0.877	0.745	
BP	BP1	0.869	0.847	0.689	0
	BP2		0.814	0.767	
	BP3		0.832	0.722	
	BP4		0.837	0.712	

(Source: SPSS processing results, 2022)

The overall Cronbach's Alpha coefficients are greater than 0.6, and the total variable correlation coefficients are all greater than 0.3, so no variable was excluded, 8 groups with 38 observed variables were included in the exploratory factor analysis process.

4.2. Exploratory factor analysis (EFA)

Table 4: Results of EFA

	Variables	KMO	Sig	Eigenvalues	Total Variances Explained	The smallest factor loading
Green supply chain management	IEM	0.843	0.000	1.788	68.241	0.820
	CWS					0.767
	CWC					0.714
	ED					0.718
Mediating variables	EJS	0.871	0.000	2.214	70.363	0.797
	OE					0.742
	RE					0.788
Business performance	BP	0.830	0.000	2.879	71.964	0.824

(Source: SPSS processing results, 2022)

KMO and Bartlett's test

Table 4 shows that the values of the KMO coefficient are greater than 0.5, so the sample is appropriate to go through the analysis process.

Bartlett's test gives the results of the significance level Sig = 0.000 < 0.05. Therefore, it can be proved that the given variables are correlated and have sufficient conditions to perform the analysis.

Eigenvalues and Total Variances Extracted

This study uses the method of factor analysis PCA (Principal Component Analysis) and Promax rotation. The results

show that there are 8 extracted factors with Eigenvalues greater than 1 (IEM, CWS, CWC, ED, EJS, OE, RE, BP), so these variances are kept in the model. The total values of variance extracted are greater than 50%, which meets requirements. The research model is assessed to be quite well-evaluated.

4.3. Multivariate regression model analysis

Table 5: Results of multivariate regression model analysis

	Adjusted R-square	Durbin-Watson	p-value of F test	Unstandardized Beta	p-value of T test	VIF
IEM → BP	0.093	1.408	0.000	0.195	0.000	1.343
CWS → BP				0.161	0.000	1.275
CWC → BP				-0.017	0.656	1.103
ED → BP				0.072	0.086	1.333
EJS → OE	0.106	1.759	0.000	0.290	0.000	1.000
OE → RE	0.213	1.590	0.000	0.456	0.000	1.000

(Source: SPSS processing results, 2022)

Adjusted R Square values show that GSCM explains 9.3% of the change in BP, EJS explains 10.6% of the change in OE, and OE explains 21.3% of the change in RE. These are not high numbers, but it cannot be concluded that the model is not good because the assessment of the R-squared value depends on many factors such as research field, research nature, sample size, the number of variables participating in the regression…

Durbin-Watson values are between 1 and 3. This is consistent with the criterion of error parts without first-order serial correlation, which indicates that the model is quite good. The sig values of the F-test are 0.000 < 0.05. Thus, the linear regression models are suitable for the population.

The sig values of t-test of IEM, CWS, EJS, OE are 0.000 < 0.05, showing that these variables are statistically significant in the model. Meanwhile, the Sig values of t-test of CWC and ED are 0.656 and 0.086 > 0.05, respectively, so these two variables are not statistically significant and should be removed from the model.

As can be seen, the unstandardized beta coefficient of IEM is higher than that of CWS, showing that internal environmental management has stronger impact on business performance than cooperation with supplier. The unstandardized beta coefficients are all greater than 0, indicating a positive relationship between independent variables and dependent variables. At the same time, VIF are all less than 2, so no multicollinearity occurs.

4.4. Bootstrap test for mediating variables

Table 6: Results of single regression from GSCM → EJS, GSCM → OE, GSCM → RE

	Unstandardized Beta	p-value
GSCM → EJS	0.2769	0.000
GSCM → OE	0.3453	0.000
GSCM → RE	0.1654	0.000

(Source: SPSS processing results, 2022)

The unstandardized Beta coefficients in single GSCM regressions → the mediating variables are greater than 0, the sig values are 0.000 < 0.05, showing that the relationships between GSCM and mediating variables (EJS, OE and RE) are statistically significant. Green supply chain management has a positive impact on Employee job satisfaction, Operational efficiency and Relational efficiency. Hypotheses H2, H4, H6 are supported at the 5% significance level.

Table 7: Results of multiple regression: GSCM, mediating variable → BP

		Unstandardized Beta	*p-value*
GSCM, EJS → BP	GSCM	0.3144	0.000
	EJS	0.2721	0.000
GSCM, OE → BP	GSCM	0.3981	0.000
	OE	0.0242	0.0441
GSCM, RE → BP	GSCM	_	_
	RE	_	0.6177

(Source: SPSS processing results, 2022)

According to Table 7, the Sig values of EJS, OE are less than 0.05, but that of RE is greater than 0.05. This shows that the

relationships between EJS, OE and BP are statistically significant, but that between RE and BP is not. Hypotheses H7 is not supported at the 5% significance level.

The unstandardized beta coefficients of EJS and OE are greater than 0, which indicates that Employee job satisfaction and Operational efficiency have a positive impact on business performance. Hypotheses H3 and H5 are supported at the 5% significance level.

At the same time, the direct impacts of GSCM → BP in 2 relationships have unstandardized beta coefficients greater than 0 and sig values less than 0.05, showing that the relationship between green supply chain management and business performance is statistically significant and this is a positive relationship. Hypothesis H1 is supported at the 5% significance level.

Table 8: Results of indirect effects of the mediating variables

	Impact	Confidence interval
Indirect impact from GSCM → BP through EJS	0.0754	[0.0496; 0.1028]
Indirect impact from GSCM → BP through OE	0.0083	[0.0263; 0.0422]

(Source: SPSS processing results, 2022)

The indirect GSCM effect→ BP through the mediating variables was presented in Table 7. If these confidence intervals do not contain zero, EJS and OE are evaluated as mediating variables in the relationship between GSCM and BP. Indeed, according to Table 7, the confidence intervals of indirect effects are [0.0496; 0.1028], [0.0263; 0.0422] do not contain 0. In conclusion, the variables Employee job satisfaction and Operational efficiency serve as the mediating variable in the relationship between green supply chain management and business performance.

This result implies that, only when firms develop policies to effectively implement green supply chain management, especially internal environmental management, will they contribute to improving the value of the business. In these days, many countries around the world have paid more attention to businesses implementing GSCM practices, especially developed countries. When businesses carry out green supply chain management, they have created many benefits for Internal insiders such as satisfying employees or improving labor productivity. This also helps businesses reduce the later cost burden related to occupational accidents and diseases industry, the cost of environmental pollution or even a claim from the surrounding discharged areas.

5. CONCLUSION

Research with the aim of evaluating the influence of green supply chain management on business performance has shown a number of remarkable results.

The relationships between the independent variable, the mediating variables and the dependent variable have been analyzed and clarified in the research paper. Specifically:

With 95% reliability, while eight hypotheses H1, H2, H3, H4, H5, H6, H8, and H9 are accepted, H7 is unaccepted.

Regarding the composition of GSCM, the results show that business performance is measured through two factors including: "Internal environmental management" and "Cooperation with suppliers". Business benefits affected by GSCM include: "Employee job satisfaction" and "Operational efficiency". Research has also made it clear that there is a direct and positive relationship between GSCM and business performance. At the same time, it is indirectly indicated that implementing green supply chain management will have a strong effect on increasing employee job satisfaction and operational efficiency, thereby promoting business's performance.

The article has analyzed the role and way of green supply chain management in Vietnamese electronic firms, focusing on cost-effective use of businesses and environmentally friendly strategies. Thereby, the article suggests that

Vietnamese enterprises need to have a development orientation and manage their supply chains in the direction of "greener", more environmentally friendly and more sustainable. Thus, in a global and constantly moving economy, businesses must find the right direction to both create a competitive position and have an environmentally friendly brand for sustainable growth.

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