RESEARCH IN MANAGEMENT OF TECHNOLOGY AND BUSINESS
e-ISSN: 2773-5044

RMTB

Vol. 5 No. 1 (2024) 937-956
https://publisher.uthm.edu.my/periodicals/index.php/rmtb

The Level of Implementation Green Supply Chain Management (GSCM) Practices among Manufacturing Industry

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DOI: https://doi.org/10.30880/rmtb.2024. 2024.05.01.063

Article Info

Received: 31 March 2024
Accepted: 30 April 2024
Available online: 30 June 2024

Keywords

Green supply chain management, operational performance, manufacturing industry

Abstract

Green supply chain management (GSCM) procedures include purchasing, manufacturing, design, raw material selection, green distribution, and logistics, all of which are critical to implementing and minimising the firm's internal and external pressures, as well as reducing errors and waste in operational processes. This study aims to investigate the level of implementation GSCM practices among manufacturing industry in Batu Pahat, Johor. The objectives are to identify the level of GSCM practices among manufacturing industry and to identify the level of operational performance among manufacturing industry. This study also aims to identify the relationship between GSCM practices and operational performances among manufacturing industry. Researcher has decided to conduct the survey at Batu Pahat, Johor. The target population of respondent for this study are the operations managers who involved in manufacturing sector around Batu Pahat, Johor. The researcher analysed the collected data quantitatively using Statistical Package for Social Sciences (SPSS) for descriptive analysis and also using correlation analysis. The questionnaire are established and distributed to target manufacturing industry. The results of this study discovered a strong relationship between GSCM practices and operational performance, indicating the major influence of customer collaboration on improving operational efficiency.

1. Introduction

Environmental problems have moved to the forefront of today's corporate environment because of increased competition and stakeholder expectations. Many operations pose environmental risks, leading most organizations to prioritize environmental issues. Integrating eco-friendly practices into business helps establish enduring values crucial for sustained success (Rasit *et al.*, 2019). According to Hejazi *et al.* (2023), rapid globalization and industrialization have significantly impacted the environment, causing issues like global warming, pollution, and hazardous incidents. As a result, researchers, governments, non-governmental organizations (NGOs), consumers, and companies have adopted green supply chain management (GSCM) as a critical sustainability strategy. According to studies, GSCM is recognized for improving competitiveness and economic performance.

GSCM covers activities like water and energy efficiency, waste management, and recycling. It influences everything from product design to delivery and disposal, aiming to reduce environmental impact (Lin *et al.*, 2020). Governments and organizations worldwide are focusing on GSCM to lessen their environmental footprint. It involves using eco-friendly materials, greener production methods, and managing post-consumer waste (Abdallah & Al-Ghwayeen, 2020). GSCM strategies tackle both internal aspects like eco-design and external factors such as green purchasing to meet environmental regulations and enhance performance (Xu *et al.*, 2022). Companies increasingly collaborate with suppliers and consumers to improve their supply chain's environmental standards.

GSCM involves various steps like purchasing, manufacturing, and distribution, crucial for reducing waste and improving processes (Ali, 2023). Linking GSCM practices to long-term performance helps cut supply chain costs and gain a competitive edge (Choudhary & Sangwan, 2022). In developing countries, GSCM improves both environmental and economic aspects by focusing on sustainable development (Choudhary & Sangwan, 2022). The focus on GSCM in industry manufacturing at Batu Pahat aims to understand their practices and operational performance. Studies emphasize GSCM's positive impact on economic, social, and environmental aspects in manufacturing, urging more research for managerial decisions (Hejazi *et al.*, 2023).

1.1 Problem Statements

Limited evidence in emerging regions makes assessing GSCM's importance challenging for enterprises (Doan *et al.*, 2022). Many advantages have been found as a result of process and equipment practices being implemented (Park *et al.*, 2022). Furthermore, they have superior effects on the firm's activities, which leads to an improvement in the firm's environment and helps offer a healthy atmosphere (Awan *et al.*, 2022). Unsustainable manufacturing in nations without environmental restrictions contributes to pollution through FDI (Ma *et al.*, 2022). Low consumer awareness affects the demand for eco-friendly products (Habib *et al.*, 2022).

The first issue is a lack of resources and infrastructure to run GSCM properly. Another possible factor is a lack of customer understanding about environmental concerns in developing nations, which leads to consumers not choosing eco-friendly items or paying higher costs (Habib *et al.*, 2022). The greening of the supply chain, on the other hand, should be considered as both a danger and an opportunity for small suppliers in their national and global markets. Along these lines, even if small and medium-sized suppliers lack the necessary resources and equipment to fully run a green supply chain, they should not be scolded and seen as bottlenecks that negatively impact the environmental performance of a whole supply chain (Kim *et al.*, 2021).

The second issue is a lack of sophistication in GSCM implementation. SEM and post hoc analyses both support the relevance of technical GSCM procedures in regulating the relationship between behavioral practices and performance. The data can be explained in terms of Chinese manufacturing companies. In other words, as compared to manufacturing enterprises in developed nations, Chinese firms are less skilled in GSCM implementation (Liu *et al.*, 2020). The government and its worldwide clients are putting significant environmental pressure on many Chinese manufacturing enterprises. As a result, technical solutions alone have been embraced to comply with environmental requirements since they are regarded a "quick" solution to linked difficulties. As their technical processes have advanced, companies in developed nations have begun to focus more on behavioral GSCM strategies that strive to involve suppliers and customers.

Therefore, to achieve the research objectives the level of GSCM practices and operational performance among manufacturing industry are determined. Consequently, the relationship between GSCM practices and operational performances among manufacturing industry is identified.

1.2 Scope of the Study

This study focuses on determining the level of implementation of GSCM practices such as Green Purchasing, Investment Recovery, Eco-Design and Packaging, Reverse Logistics, and Customer Cooperation, as well as their impact on operational performance among manufacturing industry in Batu Pahat. The poll will be held in Batu Pahat, Johor, according to the researcher. The respondents for this study are operations managers working in the manufacturing industry in and around Batu Pahat, Johor.

1.3 Significance of the Study

This study aims to identify the level of implementation Green Supply Chain Management (GSCM) practices among manufacturing industry in Batu Pahat. This research is vital to reduce environmental pollution along the entire supply chain, from raw materials to product disposal. It aims to understand how many companies implement Green Supply Chain Management (GSCM) and how it impacts their performance. Successful research can encourage more companies in Batu Pahat to adopt GSCM, benefiting both the environment and local businesses. Given the limited research on GSCM in manufacturing industry, ongoing efforts are crucial until this becomes less of a concern in Malaysia.

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2. Literature Review

2.1 GSCM

Green supply chain management (GSCM) is a new and evolving supply chain management discipline. Internal and external management, green procurement, green retailing, environmental orientation, sustainability, and return logistics are all part of the GSCM (Pakurár *et al.*, 2020). GSCM has been utilized by a number of writers as a method for introducing environment-directed thinking into SCM. Several aspects of green activities may be defined by analyzing academic definitions (Rashid, 2019). The GSCM includes traditional supply chain management as well as environmental requirements and concerns in buying organizations and long-term supplier agreements. It is all about keeping waste contained within the industrial system in order to save energy and keep dangerous pollutants from invading the environment. Industry often regards the GSCM principles as a means of evaluating suppliers' environmental performance (Ashraf *et al.*, 2020).

2.2 GSCM Practices

GSCM procedures may be characterized as a method of dealing with business challenges inside an alliance. Organizational learning and risk acceptance may be essential collaborative aspects for the effective adoption of environmental practices (Santos *et al.*, 2019). Green activities that begin with design, procurement, manufacture, distribution, and conclude with product recovery can be classified as GSCM practices, with the purpose of reducing, reusing, and recycling resources to mitigate environmental impacts (Habib *et al.*, 2021). GSCM practices have an impact on customer cooperation, supplier collaboration, and monitoring. Suppliers and consumers, according to stakeholder theory, both play an essential role, but coordination and collaboration among them will eventually supplement the GSCM (Ahmed *et al.*, 2020).

2.2.1 Green Purchasing

Green purchasing comprises procurement policies targeting environmental concerns across material acquisition, supplier selection, distribution, recycling, and product lifecycle (Assumpço *et al.*, 2019). These strategies, involving product design enhancements and collaboration, aim to produce eco-friendly items while necessitating inter-departmental teamwork and environmental audits for successful implementation. Studies affirm the positive impact of green purchasing on environmental performance (Al-Sheyadi *et al.*, 2019). Malaysian certified companies show a rising adoption of green initiatives, propelled by increased consumer preference for eco-conscious businesses due to heightened environmental awareness. Firms recognize the need for proactive environmental strategies to balance economic and operational performance amidst competitive, regulatory, and societal pressures, suggesting a notable link between green purchasing and operational success (Khan *et al.*, 2022).

2.2.2 Investment Recovery

Investment recovery refers to a company's ability to gain economic benefits by reusing or selling surplus assets, reducing costs, generating value from products through methods like redevelopment, and recycling. It involves recovering unused assets to prevent waste, either by redeploying them internally or by selling them through online avenues like auctions, reducing environmental impact and logistics. Studies suggest a strong link between environmental practices, like investment recovery, and operational performance, emphasizing their role as strategic tools for business improvement. The hypotheses indicate a significant relationship between investment recovery and operational success.

2.2.3 Eco-Design and Packaging

Eco-Design, also known as "design for the environment," involves developing products and manufacturing processes with minimal environmental impact, considering aspects like disposal, disassembly, and recycling throughout the product life cycle (Al-Sheyadi *et al.*, 2019). It focuses on reducing hazardous substances during manufacturing, enabling reuse, recycling, and recovery while conserving energy and raw materials (Lee & Lim, 2020). Within organizations, green design and packaging practices aim to create reusable, recyclable packaging, minimize waste, and eliminate hazardous materials, acknowledging the environmental impact across a product's life stages. Lifecycle assessment, a key feature of Green Supply Chain Management (GSCM), evaluates supply chain performance concerning both operations and environmental impact. The link between operational performance and eco-design and packaging is presumed to be strong.

2.2.4 Reverse Logistics

Reverse logistics involves managing the return flow of materials from users to manufacturers or recovery points, distinct from simple waste management, focusing on recovering value from products rather than just waste disposal (Pushpamali *et al.*, 2019). It includes handling returned goods, especially damaged ones, to save resources and improve manufacturing and shipping processes. This process allows recovered materials to be reused, reducing environmental risks while enhancing organizational value. Reverse logistics is seen as contributing to both operational and environmental performance, with hypotheses suggesting a significant positive relationship between reverse logistics and operational success.

2.2.5 Cooperation with Customer

Customer cooperation in green supply chains refers to partner willingness to collaborate for long-term sustainability, fostering trust and innovation within relationships (Burki *et al.*, 2019). When one partner adopts green practices, it influences others to follow suit, leading to mutual long-term benefits. Customer demands for eco-friendly products and services drive green initiatives, making collaboration vital for cleaner manufacturing processes, sustainable products, and resolving customer inquiries. Working closely with customers not only enhances environmental sustainability but also boosts operational performance. Hypotheses suggest a significant link between customer cooperation and operational success.

2.3 Importance of GSCM

As consumer interest in environmental issues grows, businesses, households, and governments face increased pressure to adopt green products and practices. ISO 14001 certification aids organizations in implementing Environmental Management Systems (EMS) to enhance environmental performance (Nowzari, 2021). By greening inbound operations and focusing on suppliers' eco-performance, purchasing plays a pivotal role in promoting sustainable materials and activities. However, cost and information sharing pose barriers to Green Purchasing (Abdallah & Al-Ghwayeen, 2020). Understanding and implementing these practices are crucial for manufacturing companies to contribute effectively to a cleaner environment and align with corporate social responsibility (Saad & Siddiqui, 2019).

2.4 Challenges of GSCM

Implementing Green Supply Chain Management (GSCM) faces challenges across institutional, organizational, informational, and economic realms, both internally and externally. The construction industry, for instance, grapples significantly with a lack of government support (Syamimi Zulkefli *et al.*, 2019). Despite recognizing GSCM's importance in addressing environmental issues, some businesses remain skeptical of its feasibility, while others encounter barriers hindering implementation (Rashid, 2019). Managers also encounter challenges in adopting and implementing GSCM practices, prompting a need to understand performance variations and contextual moderating effects (Rusmawati & Soewarno, 2021). The growing interest lies in how GSCM, coupled with business innovation, raises environmental awareness within businesses.

2.5 Manufacturing Industry in Malaysia

Due to massive exports and the Malaysian currency's peg to the US dollar, the 2007-2008 financial crisis had a severe impact on Malaysia's manufacturing sector, which accounts for 23% of GDP (Wan Mohammad *et al.*, 2022). Family-owned enterprises dominate the industry, necessitating the formation of robust audit committees in order to effectively manage risk. Following the crisis, manufacturers aim for global competitiveness and quality (AlQershi, Saufi, *et al.*, 2023). Malaysia ranks 35 in terms of innovation skills, stressing the necessity for innovative tactics to compete on a global scale (AlQershi, Ali, *et al.*, 2023). Despite an emphasis on green practices for environmental performance, the relationship between financial success and green practices remains questionable (Ghouri *et al.*, 2020). Employee underutilization of new technology training is impeding the performance of the industrial industry (Azmi *et al.*, 2020).

2.6 Operational Performance in Manufacturing Industry

Supply Chain Management (SCM) helps companies compete better by operating more efficiently, cutting costs, and boosting profits across planning, sourcing, manufacturing, and delivery levels. In smaller businesses, operational performance is key, involving flexibility, faster production, forecasting, resource planning, cost-effectiveness, and smart inventory management (Ali *et al.*, 2021). Assessing operational performance focuses on product quality, process efficiency, and productivity, critical for speed, productivity, and seamless business processes (Rumanti *et al.*, 2022). Enterprise Resource Planning (ERP) systems are crucial for efficiency, benefiting from trust-building, transformative leadership, and mobile strategies for quicker transactions

(Kembaren, 2020). Trusted leadership further enhances adaptability, connectivity, and information flow for better operational success.

3. Research Methodology

3.1 Research Design

According to Maedche *et al.* (2021), the placement of study designs employing natural experiments or time series analysis is not clear cut. Researchers recommend placing kids in the manipulate quadrant because they can use their imagination and creativity to forecast how the treatment variable/design feature will be used. The quantitative research approach was used to conduct the analysis in this study. Quantitative research is the process of gathering numerical data and converting it into statistics. Quantitative research is concerned with quantifying and analyzing variables in order to reach conclusions. It entails applying statistical methodologies to analyze numerical data in order to answer questions such as who, how much, what, where, when, how many, and how. Questionnaires, online surveys, smartphone surveys, and other survey methods will be used to collect data. As a result, the questionnaires distributed to respondents will be the primary focus of this study in order to collect data for the research objectives.

3.2 Research Population and Sample

The manufacturing industry in Batu Pahat would be the target demographic for this investigation. The sample size is defined as a sufficient number of the correct components from the population that a study of the sample and knowledge of its properties or characteristics allows us to generalize those properties or characteristics to the elements of the population. According to the Federation of Malaysian Manufacturers (FMM), the Batu Pahat region had 71 manufacturing sector (Shamsuddin *et al.*, 2020). According to Krejcie and Morgan (1970), the sample size for this study is 59 companies. As a consequence, this study needed at least 59 companies to complete the questionnaire. Table 1 is a sample size selection table developed by Krejcie and Morgan (1970).

Table 1 *Determining sample size method Krejcie and Morgan (1970)*

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.
Source: Krejcie & Morgan, 1970

3.3 Sampling Method

Random sampling and non-random sampling are the two types of sampling methodologies. Non-random sampling focuses on smaller samples and more details and particulars, whereas probability sampling refers to the procedure in which every member in the population has an equal chance of being picked. A non-random sampling approach was used in this study. There are four forms of non-random sampling: quota sampling, snowball sampling, judgement sampling, and convenience sampling. The method of data gathering used is

convenience sampling. Because of the convenience of sampling and study, the researchers were forced to use this approach. This analysis included 59 companies' samples based on table Krejcie and Morgan (1970).

3.4 Data Collection

Data collection is the process of acquiring, evaluating, and assessing proper insights for research utilizing established and recognized procedures. A researcher may evaluate their hypothesis based on the evidence gathered. The first and most important part of the research process, regardless of the subject of study, is typically data collecting. Various data collection methods are employed in various fields of study depending on the information required. This study makes use of two sorts of data: primary data and secondary data.

3.4.1 Primary Data

A primary data document or record is one that is used to capture the first or original data. The researcher may generate more realistic data by using actual data. This sort of information is created by the original writer or author. The greater the amount of original data acquired and used in this study, the more realistic the final result. As a result, original data provide a more realistic viewpoint to the researcher. The researcher employed a questionnaire as the major data instrument in this study, delivering a series of questionnaires to the target sample's operation managers who had a sufficient awareness of GSCM processes.

3.4.2 Secondary Data

Secondary data is information that has spread extensively and is generally known and heard. Other parties create this data. In this study, the researcher consults a database of online publish journals, printed books, E-books, government online documents, nongovernment online documents, newspapers, and some articles from websites as reading and writing resources. The researcher's preferred sources include an online journal accessed through the UTHM Tun Aminah Library Off-Campus Access portal, Google Scholar, and numerous renowned online open access databases.

3.5 Pilot Study

A pilot study might be extremely beneficial before beginning on a large-scale research project. A pilot study is a small-scale preliminary study conducted prior to any large-scale quantitative research to determine the viability of a larger organization. A pilot study can assist discover design problems and assess the feasibility, practicability, resources, time, and cost of a project before doing comprehensive research. Throughout the research, a pilot test was conducted prior to disseminating the questionnaire to the whole community. The pilot test employed 30 questionnaires in all.

3.6 Research Instrument

In this study, data was collected from respondents using a questionnaire technique. The questions in the entire questionnaire collection are organized into three groups. The researcher will ask a few inquiries about the company's fundamental facts in Section A. Section B, for example, includes a question on the GSCM procedures utilized by manufacturing industry in Batu Pahat. Section C examines companies' GSCM operational performance. All of the questions will be created by the researcher in the form of a closed-ended inquiry. In other words, the researcher will give a set of possibilities for the respondent to choose from depending on their best skill. This collection of questionnaires may indicate that the researcher aims to keep things as simple as possible in terms of questionnaire design and phrasing in order to make it simpler for respondents to understand the questions and create the best answer. As a consequence, the researcher will be able to obtain more accurate responses from the participants.

3.7 Data Analysis

The researcher must arrange and evaluate the data gathered during the data collection phase in order to comprehend it. Data analysis is used to identify study findings and whether the research will fulfill its goals. Data will be gathered from primary sources through the distribution of questionnaires.

3.7.1 Descriptive Analysis

The Statistical Package for Social Sciences (SPSS) Version 26 was used to analyze the survey data for this study. Advanced statistical analysis, a large library of machine learning algorithms, text analysis, open-source extensibility, big data integration, and simple application integration are all features of the SPSS software platform. SPSS is accessible to users of all skill levels because to its ease of use, versatility, and scalability.

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3.7.2 Correlation Analysis

The technique of correlation analysis is used to understand the relationship between two variables. The linear correlation coefficient (r) is one such statistic that displays how strongly two variables are related. Although correlation analysis can be linear or non-linear, Senthilnathan (2019) concentrates on linear correlation analysis because it is commonly utilized in social science research. Pearson and Spearman correlations are two typical types of correlation analysis utilized in research. Choosing between Pearson's and Spearman's correlation coefficients is analogous to picking between the median or interquartile range and the mean or standard deviation. Table 2 shows the magnitude of the correlation coefficients.

Table 2 *Correlation coefficient*

Correlation Coefficient	Strength Description
±0.81 – ±1.00	Strongest
±0.61 – ±0.80	Strong
±0.41 – ±0.60	Moderate
±0.21 – ±0.40	Weak
±0.00 – ±0.20	Weak to No Relationship

3.8 Research Flow Chart

Fig. 1 represents the process flow for conducting a study, beginning with the identification of the problem statement. This flowchart assists the researcher in conducting this study and gaining a deeper comprehension via the flowchart's summary.

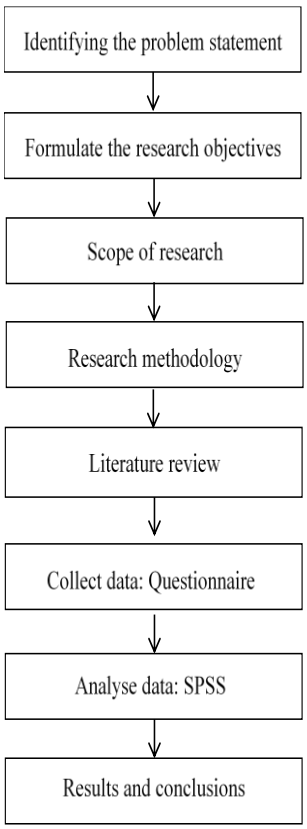

Fig. 1 *Flow chart of this study*

4. Results and Discussion

4.1 Survey Return Rate

There were 71 manufacturing industry in Batu Pahat, and the sample size for this study was 59. The questionnaires were sent to 59 businesses via email, and 45 valid questionnaires were returned. There was a 76.27% response rate to the questionnaire survey. The survey response rate is summarized in Table 3 as follows:

Table 3 *Survey Return Rate*

Population	Sample Size	Questionnaire Distribute	Questionnaire Returned	Percentage
71	59	59	45	76.27%

4.2 Reliability and Validity Analysis

To test the internal consistency or reliability of a collection of questionnaire items, the Cronbach's Alpha (α) coefficient was utilized. The test was performed for both the pilot and major studies. The questionnaire design is good if the Cronbach's Alpha (α) coefficient is greater than 0.7. As a consequence, if the research returns greater than 0.7, it can be conducted. Table 4 displays the value of the dependability coefficient.

Table 4 *Reliability coefficient value*

Cronbach's Alpha (α)	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 \geq \alpha \geq 0.8$	Good
$0.8 \geq \alpha \geq 0.7$	Acceptable
$0.7 \geq \alpha \geq 0.6$	Be Disputed
$0.6 \geq \alpha \geq 0.5$	Bad
$0.5 \geq \alpha$	Unacceptable

4.2.1 Reliability and Validity Analysis of Pilot Study

In this study, a pilot test was conducted prior to the main study to check that the questionnaire is reliable and valid. This pilot test contained 30 targeted respondents and 30 questions to validate the questionnaire design. The major purpose of the pilot test is to assess respondents' understanding of the questionnaire provided. Table 5 shows the Cronbach's Alpha (α) score for the pilot study with 30 respondents. According to the findings, the Cronbach's Alpha (α) of green purchasing is 0.902, which is excellent, investment recovery is 0.911, which is excellent, eco design and packaging is 0.891, which is good, reverse logistics is 0.888, which is good, and customer cooperation is 0.863, which is good. Cronbach's Alpha (α) for operational performance is currently 0.928, which is outstanding. The questionnaire can be utilized since all of the independent variables and the dependent variable have Cronbach's Alpha (α) values of 0.8 or higher.

Table 5 *Reliability test for pilot study*

No	Variables	Number of items	Cronbach's Alpha (α)
1.	Green Purchasing	5	0.902
2.	Investment Recovery	3	0.911
3.	Eco Design and Packaging	6	0.891
4.	Reverse Logistics	6	0.888
5.	Cooperation with Customer	5	0.863
6.	Operational Performance	7	0.928

4.2.2 Cooperation with Customer

Table 6 detailed the reliability test for the actual investigation. Cronbach's Alpha (α) scores for green purchasing are 0.929, investment recovery is 0.952, eco design and packaging is 0.928, reverse logistics is 0.931, and customer collaboration is 0.904. Cronbach's Alpha (α) for operational performance is at 0.951. Because all of the independent variables and the dependent variable have Cronbach Alpha (α) values of 0.9 or higher, the dependability is excellent. The dependability of every item chosen for inclusion in the questionnaire for this study was high.

Table 6 *Reliability test for actual study*

No	Variables	Number of items	Cronbach's Alpha (α)
1.	Green Purchasing	5	0.929
2.	Investment Recovery	3	0.952
3.	Eco Design and Packaging	6	0.928
4.	Reverse Logistics	6	0.931
5.	Cooperation with Customer	5	0.904
6.	Operational Performance	7	0.951

4.3 Demographic Analysis

The questionnaires were distributed to manufacturing sector from a variety of backgrounds in Batu Pahat, Johor. Table 7 illustrates the demographic information that was profiled and given in Section A for the companies and responders. The organizations and respondents' profiles contained the following information: Number of Employees, Annual Revenue, Years of Operation, Respondents' Working Experience, and Job Prior to Joining Manufacturing Sector. The data analysis will help to give a clear distribution of respondents. The next section will go over each thing in detail.

Table 7 *Summary of demographic analysis*

Demographic	Classification	Frequency (N)	Percentage (%)
Number of Employees	Less than 250	22	48.9
	250 – 500	16	35.6
	More than 1000	7	15.6
Annual Revenue (RM)	Less than 5 million	22	48.9
	Less than 15 million	15	33.3
	Less than 30 million	3	6.7
	Less than 50 million	5	11.1
Years of Operation (years)	1 – 5	2	4.4
	6 – 10	8	17.8
	11 – 20	10	22.2
	More than 20	25	55.6
Respondents' Working Experience (years)	Less than 5	18	40.0
	6 – 10	8	17.8
	16 – 20	9	20.0
	More than 20	10	22.2
Respondents' Job before join in Manufacturing Sector	Work with government	8	17.8
	Work with private company	22	48.9
	Self-employment	10	22.2
	None	5	11.1

4.4 Descriptive Analysis for GSCM Practices

This section will evaluate the extent to which GSCM practices exist in manufacturing industry. Section B has 25 questions divided into five categories: green purchasing, investment recovery, eco design and packaging, reverse logistics, and customer cooperation. The scores of the responses are transformed into means, and the data is utilized to discover the factors impacting the level of operational performance. Table 8 displays the combined mean and standard deviation of five components.

Table 8 *Summary analysis of average mean*

Item	Mean	Standard Deviation
Green Purchasing	4.3956	0.72424
Investment Recovery	4.2000	1.05025
Eco Design and Packaging	4.3222	0.79328
Reverse Logistics	4.3593	0.79610
Cooperation with Customer	4.4089	0.68484

4.5 Descriptive Analysis for Operational Performance

The goal of this section is to assess the level of operational performance among manufacturing industry. Section C consists of seven Likert Scale questions, with data analyzed using descriptive analysis. Descriptive analysis seeks to summarize and organize enormous volumes of data. There are two kinds of measurements: measures of central tendency and measures of variability. Table 9 displays the mean and standard deviation of operational performance.

Table 9 *Mean and standard deviation for operational performance*

No	Item	Mean	Standard Deviation
	Operational Performance		
1	Product durability	4.22	0.927
2	Perceived overall product quality	4.40	0.688
3	Promptness in solving customer complaints	4.38	0.747
4	Manufacturing throughput time	4.22	1.064
5	Meeting delivery due date	4.31	1.083
6	Ability to change delivery date	4.22	1.085
7	Ability to change product mix	4.49	0.695
	Average Mean	4.3206	0.80418

4.6 Correlation Analysis

The correlation analysis function quantifies the strength of a relationship between two or more variables. It was evaluated using information received from respondents. As a consequence, researchers may investigate the relationship between GSCM procedures and operational efficiency in manufacturing industry. Correlation coefficients, such as Spearman and Pearson's, on the other hand, indicate a linear link between the variables. Even if the correlation coefficient is zero, a non-linear relationship may occur. The Spearman correlation will be used in this research to learn how to assess the strength of the association between two ranking criteria since the data is not normal and significant. If the data are ranked or not normally distributed, King and Eckersley (2019) recommend using Spearman's rank correlation coefficients to generate a measure of correlation.

Table 10 *Result of Spearmen's correlation*

Correlations

			Overall_Mean_Green_Purchasing	Overall_Mean_Investment_Recovery	Overall_Mean_Eco_Design_And_Packaging	Overall_Mean_Reverse_Logistics	Overall_Mean_Cooperation_With_Customer	Overall_Mean_Operational_Performance
Spearman's rho	Overall_Mean_Green_Purchasing	Correlation Coefficient	1.000	.901**	.899**	.944**	.888**	.926**
		Sig. (2-tailed)	.	<.001	<.001	<.001	<.001	<.001
		N	45	45	45	45	45	45
	Overall_Mean_Investment_Recovery	Correlation Coefficient	.901**	1.000	.871**	.865**	.855**	.879**
		Sig. (2-tailed)	<.001	.	<.001	<.001	<.001	<.001
		N	45	45	45	45	45	45
	Overall_Mean_Eco_Design_And_Packaging	Correlation Coefficient	.899**	.871**	1.000	.945**	.920**	.941**
		Sig. (2-tailed)	<.001	<.001	.	<.001	<.001	<.001
		N	45	45	45	45	45	45
	Overall_Mean_Reverse_Logistics	Correlation Coefficient	.944**	.865**	.945**	1.000	.950**	.937**
		Sig. (2-tailed)	<.001	<.001	<.001	.	<.001	<.001
		N	45	45	45	45	45	45
	Overall_Mean_Cooperation_With_Customer	Correlation Coefficient	.888**	.855**	.920**	.950**	1.000	.958**
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	.	<.001
		N	45	45	45	45	45	45
	Overall_Mean_Operational_Performance	Correlation Coefficient	.926**	.879**	.941**	.937**	.958**	1.000
		Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	.
		N	45	45	45	45	45	45

**. Correlation is significant at the 0.01 level (2-tailed).

The Spearmen's Correlation Coefficient data are shown in Table 10. According to the findings, the highest Spearman's Correlation Coefficient, r, is 0.958, indicating a significant association between customer

cooperation practices and operational success. The lowest Spearman's Correlation Coefficient, r, is 0.879, indicating the highest association between investment recovery strategies and operational success. The second highest Spearman's Correlation Coefficient, r, is 0.941, indicating the strongest association between environmental design and packaging techniques and operational success. The remaining two variables, green purchasing practices and reverse logistics practices, showed Spearman's link Coefficients of 0.926 and 0.937, respectively, having the highest link with operational success.

4.6.1 Analysis for Relationship between Green Purchasing and Operation Performance

Table 11 *Calculating least square linear regression of green purchasing*

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.020	.357		.057	.955
	Overall_Mean_Green_Purchasing	.978	.080	.881	12.214	<.001

a. Dependent Variable: Overall_Mean_Operational_Performance

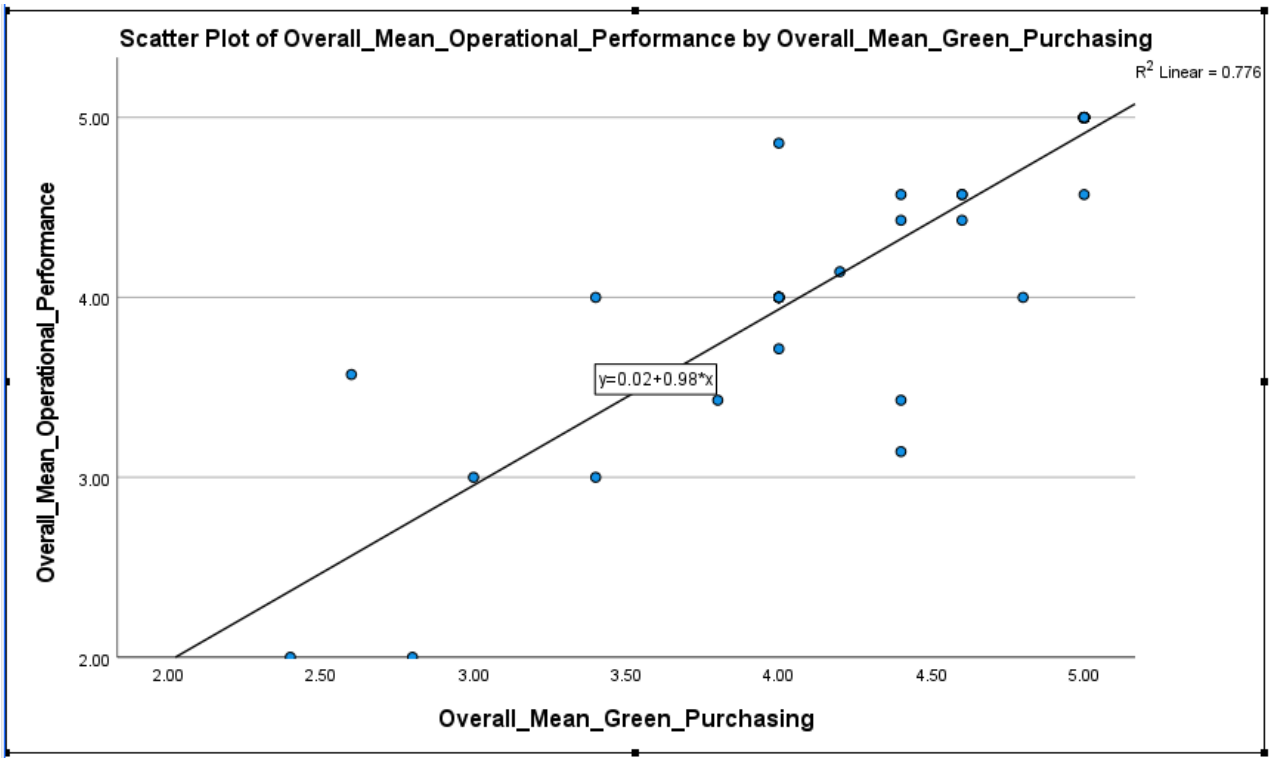

Fig. 2 *Linear Regression between green purchasing and operational performance*

The association between green buying and operational success is seen in Table 11 and Fig. 2. The resulting linear equation for this connection is y = 0.02 + 0.98x.

4.6.2 Analysis for Relationship between Investment Recovery and Operational Performance

Table 12 *Calculating least square linear regression of investment recovery*

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	1.595	.268		5.948	<.001
	Overall_Mean_Investment_Recovery	.649	.062	.848	10.470	<.001

a. Dependent Variable: Overall_Mean_Operational_Performance

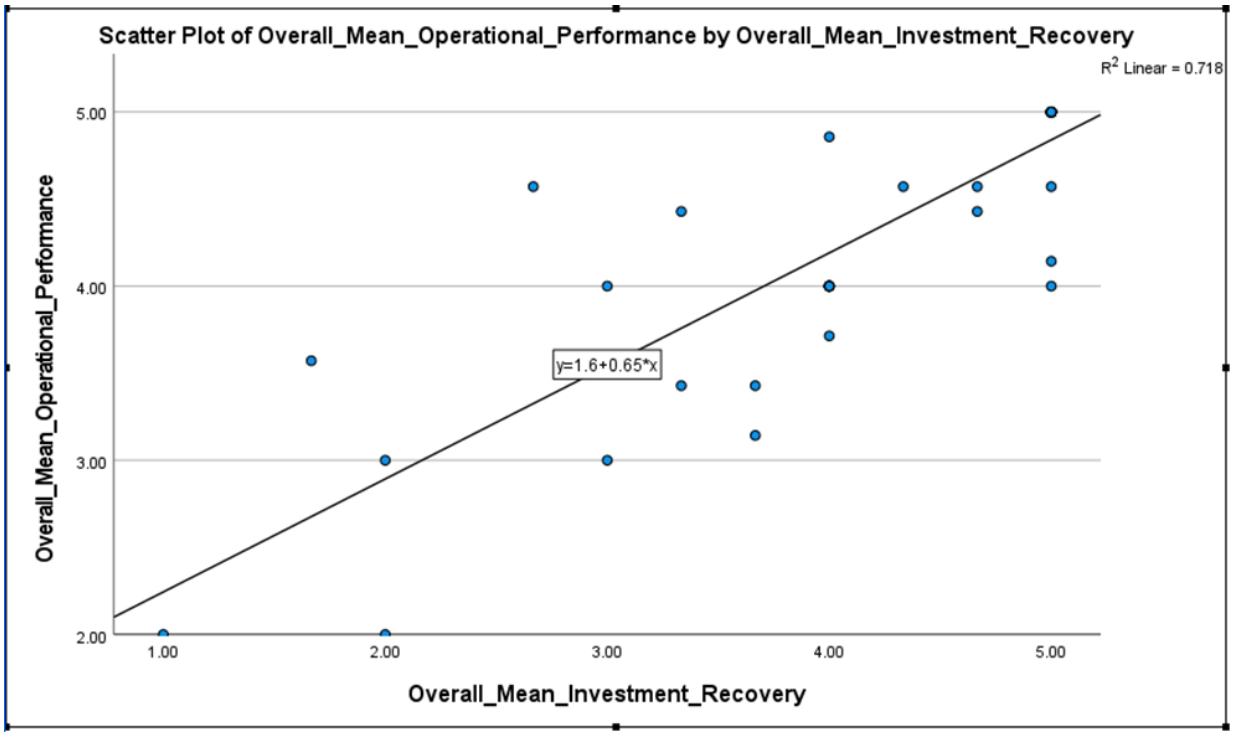

Fig. 3 *Linear regression between investment recovery and operational performance*

The link between investment recovery and operational success is seen in Table 12 and Fig. 3 above. The resulting linear equation for this connection is y = 1.6 + 0.65x.

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4.6.3 Analysis for Relationship between Eco Design and Packaging and Operational Performance

Table 13 *Calculating least square linear regression of eco design and packaging*

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.155	.211		.737	.465
	Overall_Mean_Eco_Design_And_Packaging	.964	.048	.951	20.091	<.001

a. Dependent Variable: Overall_Mean_Operational_Performance

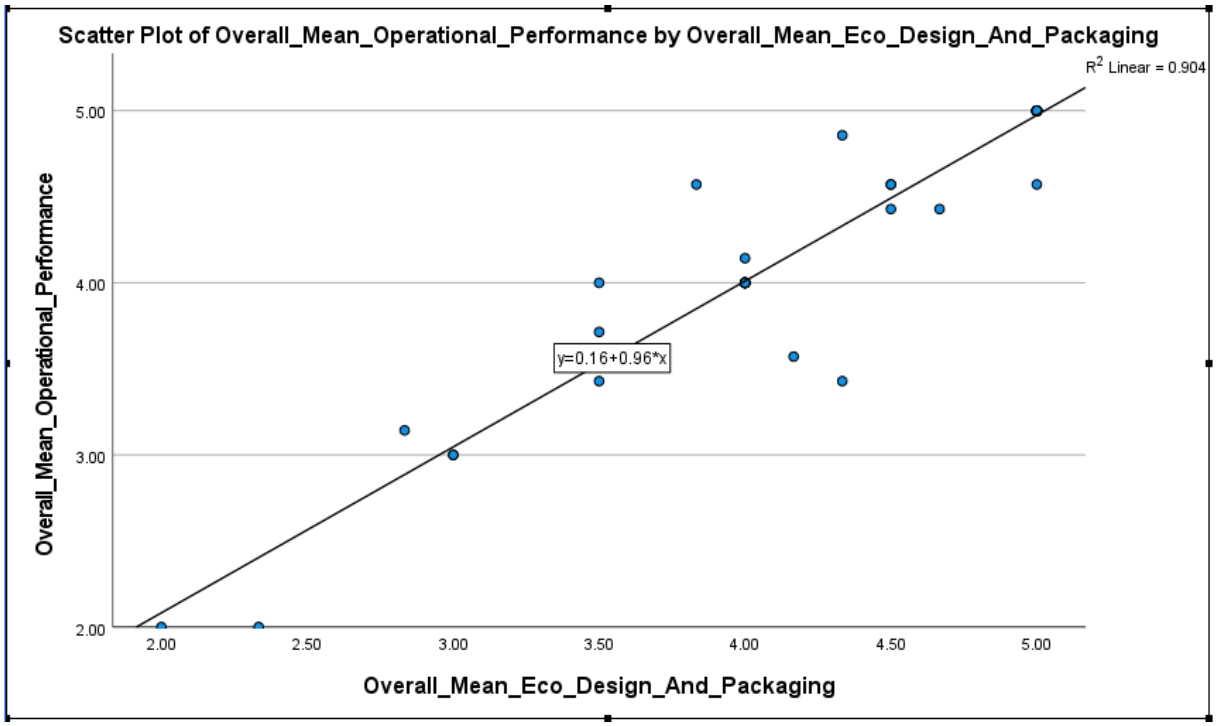

Fig. 4 *Linear Regression between eco design and packaging and operational performance*

The link between environmental design and packaging and operational performance is seen in Table 13 and Fig. 4 above. The resulting linear equation for this connection is y = 0.16 + 0.96x.

4.6.4 Analysis for Relationship between Reverse Logistics and Operational Performance

Table 14 *Calculating least square linear regression of reverse logistics*

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.404	.312		1.295	.202
	Overall_Mean_Reverse_Logistics	.898	.070	.889	12.760	<.001

a. Dependent Variable: Overall_Mean_Operational_Performance

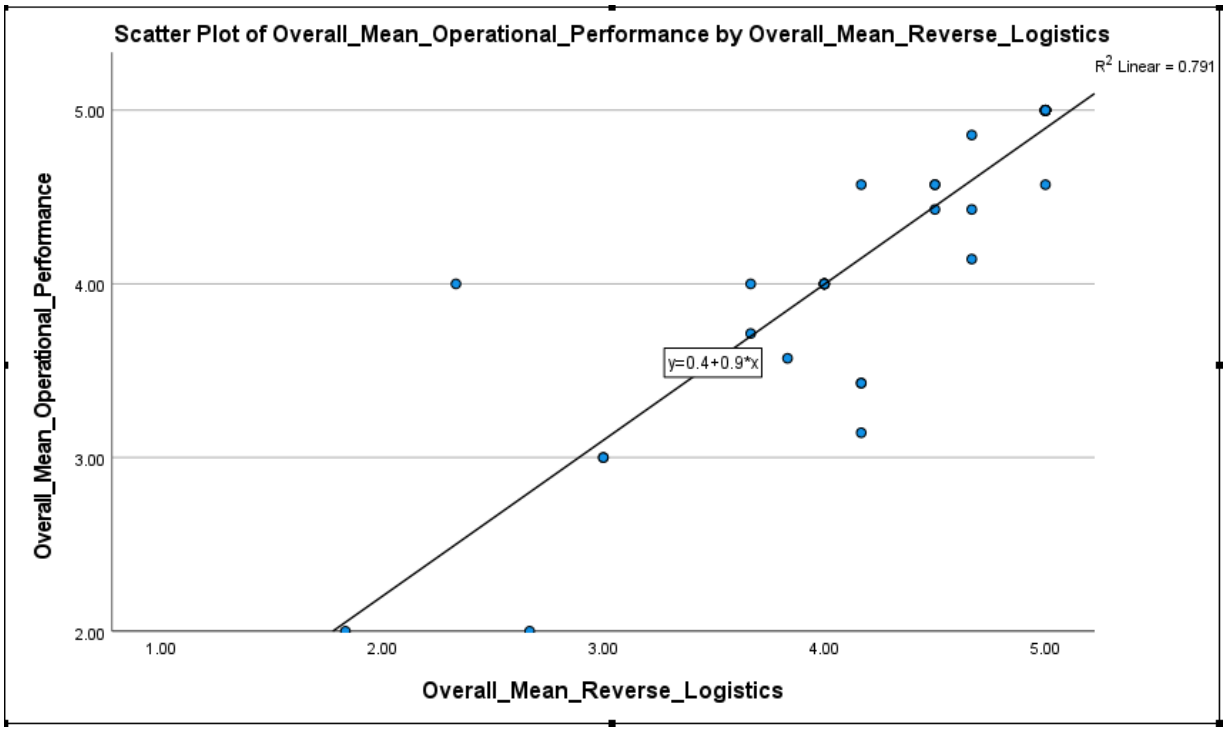

Fig. 5 *Linear Regression between reverse logistics and operational performance*

The link between reverse logistics and operational performance is seen in Table 14 and Fig. 5 above. The resulting linear equation for this connection is y = 0.4 + 0.9x.

4.6.5 Analysis for Relationship between Reverse Logistics and Operational Performance

Table 15 *Calculating least square linear regression of cooperation with customer*

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.627	.235		-2.664	.011
	Overall_Mean_Cooperation_With_Customer	1.122	.053	.956	21.274	<.001

a. Dependent Variable: Overall_Mean_Operational_Performance

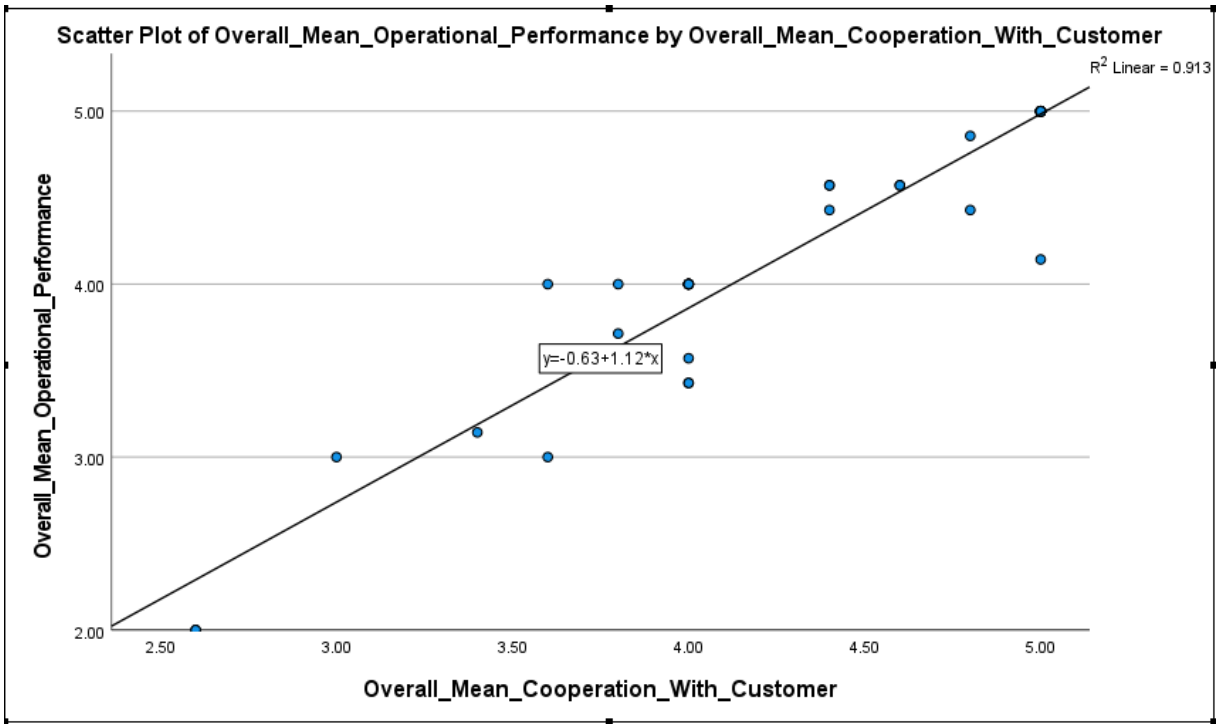

Fig. 6 *Linear regression between cooperation with customer and operational performance*

The association between customer collaboration and operational success is seen in Table 15 and Fig. 6 above. The resulting linear equation for this connection is y = -0.63 + 1.12x.

5. Recommendations and Conclusion

5.1 Introduction

This chapter will summarize the findings from Chapter 4 and provide conclusions and recommendations. Previous research findings will be studied and compared to contemporary research findings. This chapter will also discuss the research question and purpose. In doing this form of research study, the researcher has also supplied some opinions and suggestions for future research. Finally, this chapter will come to an end.

5.2 Overall Summary

The manufacturing industry in Batu Pahat, Johor, are the target respondents in this study. The original sample size was 59 firms, however only 45 companies agreed to participate in the research. The questionnaire was issued in order to determine the level of GSCM practices among manufacturing industry, the level of operational performance among manufacturing industry, and the link between GSCM practices and operational performance

among manufacturing industry. The questionnaire was created using five GSCM practices: green purchasing, investment recovery, eco design and packaging, reverse logistics, and customer participation.

The mean and significance of all GSCM practices have been determined, which aids in demonstrating the link between GSCM practices and the dependent variable, operational performance. According to the data, the majority of the enterprises, around 22 out of 45, have fewer than 250 employees. The majority of firms in this survey had annual revenues of less than $5 million, with 22 respondents, while the majority of companies have been in business for more than 20 years, with 25 respondents. With 18 replies, the majority of operations managers had less than 5 years of experience. Finally, 22 of the operations managers had previously worked for a private firm before joining a manufacturing sector.

5.3 Summary based on Research Objective

5.3.1 Research Objective 1

Questionnaires are utilized in this study to determine the extent of GSCM practices among manufacturing industry in Batu Pahat, Johor. Section B of the questionnaire contains five elements, each with 25 questions: Green Purchasing, Investment Recovery, Eco Design and Packaging, Reverse Logistics, and Customer Cooperation. The respondents evaluated the score based on whether they strongly disagreed, disagreed, somewhat agreed, or strongly agreed.

The most popular dominant practices in GSCM implementation are customer cooperation activities, whereas investment recovery practices are the least popular. According to this data, the second greatest mean value obtained by green buying techniques was 4.2000. The mean values for eco design and packaging and reverse logistics were 4.3222 and 4.3593, respectively. As a result, manufacturing industry in Batu, Pahat should invest more in GSCM techniques. Creating things that use environmentally friendly materials and packaging that avoids waste and encourages recycling or reuse, for example.

5.3.2 Research Objective 2

In this study, questionnaires are used to measure the level of operational performance among manufacturing industry. There are seven Likert Scale questions, and the answers will be examined descriptively. The replies' ratings are averaged, and the findings are used to assess the level of operational performance. The score was assigned depending on whether the respondents strongly disagreed, disagreed, slightly agreed, or strongly agreed.

The capacity to adjust product mix had the highest mean rating, with a mean value of 4.49. Meanwhile, the lowest mean was 4.22 for product durability, production throughput time, and the flexibility to adjust delivery date. The perceived overall product quality comes in second with a mean value of 4.40. The mean value for responding quickly to customer concerns was 4.38, while the mean value for achieving delivery deadlines was 4.31. The average mean value for operational performance was 4.3206. As a result, Batu, Pahat's manufacturing industry should increase their operational performance. Investing in employee training programs to increase skills and knowledge, for example, can result in a more skilled workforce, which leads to higher production and output. Furthermore, increasing employee participation and engagement can boost morale and efficiency.

5.3.3 Research Objective 3

The researcher employed a questionnaire as the major data instrument in this study, delivering a series of questionnaires to operations managers with appropriate knowledge of GSCM processes in manufacturing industry included in the target sample. The researcher in this study used Spearman's Correlation Coefficient to establish a link between the two variables. The independent variable in this study is Green Purchasing, Investment Recovery, Eco Design and Packaging, Reverse Logistics, and Customer Cooperation, whereas the dependent variable is Operational Performance.

According to the findings, the highest Spearman's Correlation Coefficient, r, is 0.958, indicating a significant association between customer cooperation practices and operational success. The lowest Spearman's Correlation Coefficient, r, is 0.879, indicating the highest association between investment recovery strategies and operational success. Based on the findings of this study, we can conclude that customer collaboration methods will have a more favorable influence on operational performance. Customer collaboration to better understand their demand patterns, preferences, and market trends. This shared data may help Batu Pahat manufacturing industry optimize stocks, production schedules, and resource allocation, reducing waste and enhancing efficiency. Seeking and incorporating active customer feedback into product development and refinement processes. This collaboration helps to enhance product designs, increase quality, and ensure that goods meet or exceed customer expectations.

5.4 Limitations of Research

Several restrictions impacted the study's scope and data collection technique. The constraint that researchers encountered during data collecting was a major issue. It was challenging to collect surveys from respondents. Respondents' refusal to complete the questionnaire or their perception that it would be a time-consuming endeavor were among the challenges encountered, resulting in the retrieval of only 45 of the 59 supplied questionnaires. Furthermore, the method of distribution of the questionnaire was confined to email, which may have resulted in limited reach and response rates due to technological limitations or disparities in email access among the target audience. Furthermore, the study's focus was confined to manufacturing industry in Johor's Batu Pahat region, reducing the diversity of opinions and hence restricting the generalizability of findings outside this narrow environment. Addressing these constraints is crucial for future research endeavors, which may involve experimenting with alternative data collection methods and widening the geographic scope to increase the research's comprehensiveness and usefulness.

5.5 Recommendations for future study

Based on the study's findings, numerous recommendations for future research have been made. Overall, the GSCM procedures of Batu Pahat's manufacturing industry were moderate. It would surely have an influence on operational performance because there was a direct and positive relationship between GSCM processes and operational performance. As a consequence, manufacturing industry in Batu Pahat should continue to use GSCM approaches in order to increase performance in future studies. Current organizations that have embraced GSCM approaches might be urged to improve and optimize their GSCM practices in day-to-day supply chain management if possible. For example, they might prioritize less often used GSCM activities such as Eco Design and Packaging while attempting to enhance more regularly used practices such as Customer Cooperation, Green Purchasing, and Reverse Logistics. It indirectly enhances the company's operation and reputation while also caring for the operations. It has the potential to benefit everyone while having few or no drawbacks.

5.6 Conclusion

The study examined GSCM practices among Batu Pahat manufacturing industry and observed a low level of adoption. The study revealed a substantial association between GSCM practices and operational performance, demonstrating that customer participation has a significant impact on enhancing operational efficiency. Future study should concentrate on GSCM practice maintenance and development, with a focus on underutilized aspects such as Eco Design and Packaging, as well as Investment Recovery, while optimizing commonly used practices. Addressing data collection constraints and expanding geographical reach would strengthen the comprehensiveness and usefulness of future studies for Batu Pahat sector's long-term growth and performance improvement.

Acknowledgement/Penghargaan

The authors would like to thank the Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia for its support.

Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** A.S.S. and R.C.; **data collection:** A.S.S.; **analysis and interpretation of results:** A.S.S.; **draft manuscript preparation:** : A.S.S. and R.C. All authors reviewed the results and approved the final version of the manuscript.

References

Abdallah, A. B., & Al-Ghwayeen, W. S. (2020). Green supply chain management and business performance: The mediating roles of environmental and operational performances. *Business Process Management Journal*, *26*(2), 489–512. https://doi.org/10.1108/BPMJ-03-2018-0091

Ahmed, W., Ashraf, M. S., Khan, S. A., Arhin, F. K., Kusi-Sarpong, H., & Najmi, A. (2020). *Analyzing the impact of environmental collaboration among supply chain stakeholders on a firm's sustainable performance*.

Ali, M. H., Suleiman, N., Khalid, N., Tan, K. H., Tseng, M. L., & Kumar, M. (2021). Supply chain resilience reactive strategies for food SMEs in coping to COVID-19 crisis. In *Trends in Food Science and Technology* (Vol. 109, pp. 94–102). Elsevier Ltd. https://doi.org/10.1016/j.tifs.2021.01.021

Ali, Z. (2023). Predicting SMEs performance through green supply chain practices: a mediation model link of business process performance. *Asia Pacific Journal of Marketing and Logistics*, *35*(2), 432–450. https://doi.org/10.1108/APJML-05-2021-0296

AlQershi, N. A., Ali, G. A., Al-Rejal, H. A., Al-Ganad, A., Farhan Busenan, E., & Ahmed, A. (2023). The power of strategic knowledge management in the relationship between innovation and the performance of large manufacturing firms in Malaysia. *International Journal of Innovation Science*, *15*(1), 19–41. https://doi.org/10.1108/IJIS-01-2021-0019

AlQershi, N. A., Saufi, R. B. A., Muhammad, N. M. N., Bin Yusoff, M. N. H., & Thurasamy, R. (2023). Green creativity, TQM and business sustainability of large manufacturing firms in Malaysia. *TQM Journal*, *35*(4), 924–945. https://doi.org/10.1108/TQM-10-2021-0309

Al-Sheyadi, A., Muyldermans, L., & Kauppi, K. (2019). *The complementarity of green supply chain management practices and the impact on environmental performance*.

Ashraf, S., Ahmed, T., Saleem, S., & Aslam, Z. (2020). Diverging Mysterious in Green Supply Chain Management. *Oriental Journal of Computer Science and Technology*, *13*(1), 22–28. https://doi.org/10.13005/ojcst13.01.02

Assumpção, J. J., Campos, L. M. de S., Jabbour, A. B. L. de S., Jabbour, C. J. C., & Vazquez-Brust, D. A. (2019). Green Supply Chain Practices: A comprehensive and theoretically multidimensional framework for categorization. *Production*, *29*. https://doi.org/10.1590/0103-6513.20190047

Awan, F. H., Dunnan, L., Jamil, K., Mustafa, S., Atif, M., Gul, R. F., & Guangyu, Q. (2022). Mediating Role of Green Supply Chain Management Between Lean Manufacturing Practices and Sustainable Performance. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.810504

Azmi, N.A., Zakaria, N.B., Abd Sata, F.H. and Sanusi, Z.M. (2020), "Political connection and firm's performance among Malaysian firms", International Journal of Financial Research, Vol. 11 No. 3.

Burki, U., Ersoy, P., & Najam, U. (2019). Top management, green innovations, and the mediating effect of customer cooperation in green supply chains. *Sustainability (Switzerland)*, *11*(4). https://doi.org/10.3390/su11041031

Choudhary, K., & Sangwan, K. S. (2022). Green supply chain management pressures, practices and performance: a critical literature review. In *Benchmarking* (Vol. 29, Issue 5, pp. 1393–1428). Emerald Group Holdings Ltd. https://doi.org/10.1108/BIJ-05-2021-0242

Doan, T. D. U., Nguyen, T. H., Tran, T. H., Nguyen, D. N., Nguyen, V. H., Phan, T. T. H., & Nguyen, T. T. H. (2022). The moderating role export and firm size on the relationship between green supply chain management and operational performance. *Uncertain Supply Chain Management*, *10*(4), 1161–1174. https://doi.org/10.5267/j.uscm.2022.8.011

Ghouri, A. M., Mani, V., Khan, M. R., Khan, N. R., & Srivastava, A. P. (2020). Enhancing business performance through green human resource management practices: an empirical evidence from Malaysian manufacturing industry. *International Journal of Productivity and Performance Management*, *69*(8), 1585–1607. https://doi.org/10.1108/IJPPM-11-2019-0520

Habib, M. A., Balasubramanian, S., Shukla, V., Chitakunye, D., & Chanchaichujit, J. (2022). Practices and performance outcomes of green supply chain management initiatives in the garment industry. *Management of Environmental Quality: An International Journal*, *33*(4), 882–912. https://doi.org/10.1108/MEQ-08-2021-0189

Habib, M. A., Bao, Y., Nabi, N., Dulal, M., Asha, A. A., & Islam, M. (2021). Impact of strategic orientations on the implementation of green supply chain management practices and sustainable firm performance. *Sustainability (Switzerland)*, *13*(1), 1–21. https://doi.org/10.3390/su13010340

Hejazi, M. T., Al Batati, B., & Bahurmuz, A. (2023). The Influence of Green Supply Chain Management Practices on Corporate Sustainability Performance. *Sustainability*, *15*(6), 5459. https://doi.org/10.3390/su15065459

Kembaren, J. (2020). Enhancing Operational Performance through ERP Performance. *International Journal of Advanced Trends in Computer Science and Engineering*, *9*(2), 1002–1004. https://doi.org/10.30534/ijatcse/2020/16922020

Khan, M. T., Idrees, M. D., Rauf, M., Sami, A., Ansari, A., & Jamil, A. (2022). Green Supply Chain Management Practices' Impact on Operational Performance with the Mediation of Technological Innovation. *Sustainability (Switzerland)*, *14*(6). https://doi.org/10.3390/su14063362

Kim, S. T., Lee, H. H., & Lim, S. (2021). The effects of green scm implementation on business performance in smes: A longitudinal study in electronics industry. *Sustainability (Switzerland)*, *13*(21). https://doi.org/10.3390/su132111874

King, A. P., & Eckersley, R. J. (2019). Descriptive Statistics II: Bivariate and Multivariate Statistics. In *Statistics for Biomedical Engineers and Scientists* (pp. 23–56). Elsevier. https://doi.org/10.1016/b978-0-08-102939-8.00011-6

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, vol. 30, no. 3, pp. 607-610, 1970.

Lee, C., & Lim, S. Y. (2020). Impact of environmental concern on image of internal GSCM practices and consumer purchasing behavior. *Journal of Asian Finance, Economics and Business*, *7*(6), 241–254. https://doi.org/10.13106/JAFEB.2020.VOL7.NO6.241

Lin, C. Y., Alam, S. S., Ho, Y. H., Al-Shaikh, M. E., & Sultan, P. (2020). Adoption of green supply chain management among SMEs in Malaysia. *Sustainability (Switzerland)*, *12*(16). https://doi.org/10.3390/su12166454

Liu, J., Hu, H., Tong, X., & Zhu, Q. (2020). Behavioral and technical perspectives of green supply chain management practices: Empirical evidence from an emerging market. *Transportation Research Part E: Logistics and Transportation Review*, *140*. https://doi.org/10.1016/j.tre.2020.102013

Ma, X., Akhtar, R., Akhtar, A., Hashim, R. A., & Sibt-e-Ali, M. (2022). Mediation effect of environmental performance in the relationship between green supply chain management practices, institutional pressures, and financial performance. *Frontiers in Environmental Science*, *10*. https://doi.org/10.3389/fenvs.2022.972555

Maedche, A., Gregor, S., & Parsons, J. (2021). Mapping design contributions in information systems research: The design research activity framework. *Communications of the Association for Information Systems*, *49*, 355–378. https://doi.org/10.17705/1CAIS.04914

Nowzari, D. (2021). *Green Supply Chain Management (GSCM) In Manufacturing Industry in Malaysia*. http://www.centralasianstudies.org

Pakurár, M., Khan, M. A., Benedek, A., & Oláh, J. (2020). The impact of green practices, cooperation and innovation on the performance of supply chains using statistical method of meta-analysis. *Journal of International Studies*, *13*(3), 111-128. https://doi.org/10.14254/2071-8330.2020/13-3/8

Park, S. R., Kim, S. T., & Lee, H. H. (2022). Green Supply Chain Management Efforts of First-Tier Suppliers on Economic and Business Performances in the Electronics Industry. *Sustainability (Switzerland)*, *14*(3). https://doi.org/10.3390/su14031836

Pushpamali, N. N. C., Agdas, D., & Rose, T. M. (2019). A review of reverse logistics: An upstream construction supply chain perspective. In *Sustainability (Switzerland)* (Vol. 11, Issue 15). MDPI. https://doi.org/10.3390/su11154143

Rashid, M. A. (2019). Critical success factors for green supply chain management practices: An empirical study on data collected from food processing companies in Saudi Arabia. *African Journal of Business Management*, *13*(5), 160–167. https://doi.org/10.5897/ajbm2018.8709

Rasit, Z. A., Zakaria, M., Hashim, M., Ramli, A., & Mohamed, M. (2019). Green Supply Chain Management (GSCM) practices for sustainability performance: An empirical evidence of Malaysian SMEs. *International Journal of Financial Research*, *10*(3), 371–379. https://doi.org/10.5430/ijfr.v10n3p371

Rumanti, A. A., Rizana, A. F., Septiningrum, L., Reynaldo, R., & Isnaini, M. M. (2022). Innovation Capability and Open Innovation for Small and Medium Enterprises (SMEs) Performance: Response in Dealing with the COVID-19 Pandemic. *Sustainability (Switzerland)*, *14*(10). https://doi.org/10.3390/su14105874

Rusmawati, Z., & Soewarno, N. (2021). The role of green technology to investigate green supply chain management practice and firm performance. *Uncertain Supply Chain Management*, *9*(2), 421–428. https://doi.org/10.5267/j.uscm.2021.2.001

Saad, M., & Siddiqui, D. A. (2019). The Impact of Green Supply Chain Management on Firm Performance: A Case of Manufacturing Industry of Karachi. *Journal of Management and Strategy*, *10*(5), 48. https://doi.org/10.5430/jms.v10n5p48

Santos, H., Lannelongue, G., & Gonzalez-Benito, J. (2019). Integrating green practices into operational performance: Evidence from Brazilian manufacturers. *Sustainability (Switzerland)*, *11*(10). https://doi.org/10.3390/su11102956

Senthilnathan, S. (2019). Usefulness of Correlation Analysis. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3416918

Shamsuddin, A., Nurul Karimah Wan Ahmad, W., & Chun Peng, L. (2020). Green Supply Chain Management Practice and Performance of Manufacturing Companies in Batu Pahat, Johor. In *Int. J Sup. Chain. Mgt* (Vol. 9, Issue 1). http://excelingtech.co.uk/

Syamimi Zulkefli, N., Mahmud, F., & Mohd Zainudin, N. (2019). A Survey on Green Supply Chain Management (GSCM) Challenges in the Malaysian Construction Industry. *KnE Social Sciences*. https://doi.org/10.18502/kss.v3i22.5120

Wan Mohammad, W. M., Nik Salleh, N. M. Z., & Wan Yusoff, W. F. (2022). Does audit committee constrain firms' risks in Malaysian family manufacturing firms? *Accounting Research Journal*, *35*(5), 616–636. https://doi.org/10.1108/ARJ-01-2021-0025

Xu, J., Yu, Y., Wu, Y., Zhang, J. Z., Liu, Y., Cao, Y., & Eachempati, P. (2022). Green supply chain management for operational performance: anteceding impact of corporate social responsibility. *Journal of Enterprise Information Management*, *35*(6), 1613–1638. https://doi.org/10.1108/JEIM-06-2021-0260