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Green Manufacturing Practices and Sustainable Performance of Organization in Selected Manufacturing Companies in Kegalle District of Sri Lanka

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Abstract

This study aims to examine the impact of green manufacturing practices on sustainable performance of organization. In order to achieve the study objective, primary data were collected through a questionnaire-based survey among 70 manufacturing companies which are operating in Kegalle district of Sri Lanka. This study has used the convenience sampling (availability sampling) method and the unit of analysis was individual firms. The simple regression analysis was used to test the research model. The findings of the study revealed that there is a moderate level of green manufacturing practices implemented in the selected manufacturing companies and sustainable performance of surveyed companies was recorded at in moderate level. And the findings of the study also suggested that green manufacturing practices have a significant and positive impact on sustainable performance of organization. This study suggested that manufacturing organizations need to focus more on the implementation of green manufacturing practices to ensure organizational sustainability.

Keywords: *Green manufacturing, sustainable performance, Sri Lanka*

Introduction

The prominence of sustainability has risen as a result of economic globalization, increasing social and environmental awareness, media attention, and pressure

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from a variety of stakeholder groups. Thus, the world has been making progress towards sustainable development. According to Opatha (2019, p. 3), sustainability is defined as "deliberate constant endeavour to utilize human and other resources, and natural environment to meet needs of current human beings as well as non-human beings while maintaining and if possible enhancing human and other resources, and natural environment to meet needs of future human beings and non-human beings." In recent years, sustainability has become one of the primary objectives of organizations in order to become the contributors to sustainable development. Organizational sustainability is operationalized based on the triple bottom line (TBL) framework which includes three performance dimensions, namely, economic, social and environmental performance (Willard, 2002). As a result, contemporary organizations need to focus equally on environmental and social performance in addition to economic performance in order to ensure organizational sustainability. Organizations have faced pressure from stakeholders to adopt environmentally friendly business practices to boost sustainability. Thus, several organizations respond to this issue by applying several green practices such as green management, green human resource management, green accounting, green marketing, etc. to reduce their ecological footprint and satisfy their stakeholders.

Manufacturing industries are critical to a country's economic development. In this perspective, the Sri Lankan manufacturing sector also makes a significant contribution to the country's economic progress (Central Bank Annual Report, 2020). According to a report published by the United Nations Environmental Programme (UNEP) in 2011, the manufacturing industry is responsible for 20% of global carbon dioxide emissions and accounts for about 35% of global electricity use. Furthermore, the manufacturing industry presently accounts for roughly 10% of global water consumption, with this figure predicted to rise to over 20% by 2030. Moreover, the risks connected with the use of hazardous chemicals are growing as the industry grows in new markets. Furthermore, industrial businesses are responsible for 17% of all air pollution. In this context, manufacturing organizations are in a big necessity to maintain a solid commitment to green manufacturing which provides the long-standing assurance for organizational sustainability.

Researchers discovered that manufacturers may be able to reduce negative environmental effects and resource consumption throughout a product's life cycle (Liu, Zheng, & Cheng, 1999; Melngk & Smith 1996). Furthermore,

manufacturers utilize green manufacturing processes and procedures to save energy and resources, mitigate potentially dangerous waste via reuse and recycling, and avoid contamination at the source (Inman & Green, 2018). In addition to that, the adaptation of green manufacturing practices supports companies to align with environmental laws and regulations imposed by the governments and regulatory bodies and contribute to establishing the image as the greener organizations (Zhu & Sarkis, 2004). Due to these benefits, manufacturing organizations strive to adopt green manufacturing practices to gain a sustainable competitive advantage. A study conducted by Rehman, Seth and Shrivastava (2016) in the Indian context regarding green manufacturing practices indicated that prior research works in green manufacturing practices mostly come under conceptual work and has limited empirical studies. They also pointed out that available research works did not cover the entire spectrum of green manufacturing and they over served missing links among them.

In recent years, an increasing number of researchers have added to our knowledge of green manufacturing (Govindan et al., 2014; Chuang & Yang, 2014; Yu & Ramanathan, 2015; Inman & Green, 2018; Yacob et al., 2018; Mao & Wang, 2018; Afum et al., 2020a; Afum et al., 2020b). In this context, researchers link the relationship between green manufacturing practices and sustainability performance in an organizational context (Afum et al., 2020a; Afum et al., 2020b). Moreover, most empirical studies on the association between green manufacturing practices and organizational sustainable performance have focused on manufacturing companies in developed nations (Zhan et al., 2018). However, only a few research studies were conducted in the Sri Lankan context in connection with green manufacturing (e.g., Kalhari, et al., 2019) and green supply chain management practices (e.g., Priyashani and Gunarathne, 2021). As the consequence of the high environmental challenges such as climate change, depletion of forest cover, land degradation, solid waste disposal, including non-degradable and e-waste, threats to wildlife, coastal erosion, air pollution, and pollution of water bodies, Sri Lanka has a strong need to focus on developing a sustainable development policy framework (Central Bank Annual Report, 2020), which provoked and stimulated the necessity of Sri Lankan manufacturing companies to pay more attention on their sustainability performance as they significantly contribute to environmental pollution compared to other sectors. On other hand, previous studies did not focus on the linked between green manufacturing practices and sustainability performance in Sri Lankan context. In this context, there is a need to explore more on the link

between green manufacturing practices and sustainable performance theoretically and empirically. Moreover, anecdotal evidences revealed that a very few research works are available in this area in Sri Lanka. Therefore, researchers are intended to carry out this study because Sri Lankan manufacturing companies strive to align the environmental sustainability agenda to the guidelines set out by international and local organizations, such as the United Nations Global Compact (UNGC), Leadership in Energy and Environmental Design (LEED) and Central Environmental Authority of Sri Lanka. On the other hand, in general, the same sector has been treated as one of the major contributors to air, water, and earth pollution compared to other sectors.

Hence, these issues and empirical knowledge gap in the context of Sri Lanka evident that the association between green manufacturing practices and sustainable (environmental economic and social) performance of manufacturing organizations remain an unexplored area of research. Thus, in order to address the identified empirical knowledge gap, the current study was initiated with two research objectives. Therefore, this research will be useful to managers and practitioners, particularly in Sri Lanka. In light of these facts, researchers carried out this study to examine the impact of green manufacturing practices on sustainable performance of organization.

Research Objectives

1. To find out the levels of green manufacturing practices and sustainable performance of the selected manufacturing companies in the Kegalle district of Sri Lanka.
2. To examine the impact of green manufacturing practices on sustainable performance of the selected manufacturing companies in the Kegalle district of Sri Lanka.

Literature Review

Green Manufacturing

The concept of green manufacturing has gained tremendous popularity across the world. Green manufacturing is totally in contrast to traditional manufacturing, which aims to protect the natural environment via adopting green manufacturing practices and initiatives. Manufacturing firms began to apply green manufacturing techniques with the launch of ISO 14001 in 1996 to ensure regulatory compliance as well as obtain a competitive edge (Govindan et al., 2014). Environmental measures worldwide, green development trends, and

fierce industrial rivalry all push businesses to implement green manufacturing methods as quickly as possible (Chuang & Yang 2014). Many manufacturing companies seek certification for their environmental management systems (EMS) to show governments, consumers, suppliers, and other stakeholders that they have embraced green manufacturing practices (Mao & Wang, 2018). EMS certification can be considered as a reward for the company's environmental concern and efforts.

According to Melngk and Smith (1996, p. 60), green manufacturing referred as "a system that integrates product and process design issues with issues of manufacturing planning and control in such a manner as to identify, quantify, assess, and manage the flow of environmental waste with the goal of reducing and ultimately minimizing environmental impact while also trying to maximize resource efficiency". Further, Srivastava (2007), defined green manufacturing as environmentally friendly manufacturing processes and activities that cover the entire stages or phases of manufacturing operations of an organization. According to Hofer et al. (2012), green manufacturing referred to all the environmental management initiatives which are practiced by an organization during the manifesting operations in order to satisfy the internal and external stakeholders as well as to achieve competitive advantages. Green manufacturing is considered as the use of environmentally friendly and more efficient input materials during the production process in order to reduce or eliminate negative environmental impacts (Ghazilla et al., 2015). According to Toke and Kalpande (2019), green manufacturing is about minimizing negative environmental impacts by reducing toxins, waste, pollution, best use of input raw materials and energy by implementing end of life, cradle to cradle and close loop approaches. Based on the above definitions, researchers defined green manufacturing as the set of green policies, practices, and systems connected with the company's manufacturing processes to reduce the negative environmental impacts and enhance the positive environmental impacts.

Sustainable Performance of Organization

According to Opatha (2019, p. 3), organizational sustainability is defined as the "deliberate consent endeavour to utilize human and other resources, and natural environment to meet needs of current stakeholders of the organization while maintaining and if possible enhancing human and other resources, and natural environment to meet needs of future stakeholders". Therefore, the Triple Bottom Line (People, Planet and Profit) is considered the valid framework to

measure the organization's sustainable performance. Sustainable performance guarantees that businesses achieve a comprehensive balance of economic, environmental, and social performances. In this climate, a rising number of businesses appear inclined to disclose their economic, social, and environmental sustainability performance (Schaltegger & Wagner, 2006). This is reinforced by the expansion of reporting standards, such as the global reporting initiatives (Ehnert et al., 2016).

The following definitions for the economic, social, and environmental performance of sustainable organizations are provided in order to achieve the study objectives:
Economic performance of an organization relates to its profitability and growth (Judge and Douglas, 1998).Social performance refers to the actual achievement of the organization in terms of increasing and sustaining the quality and standard of life without ignoring environmental concerns and protection (Yusuf et al., 2013).
Manufacturing businesses achieve environmental performance by minimizing solid and water waste, reducing carbon emissions, reducing the usage of contaminated and toxic inputs, reducing the frequency of environmental accidents, and minimizing the entire environmental effect of their operations (Centobelli et al., 2019; Çankaya and Sezen, 2019).

The Relationship between Green Manufacturing Practices and Environmental Performance

Manufacturing organizations bear a great responsibility to adapt green manufacturing practices to serve the natural environment. A number of environmental specialists have emphasized the need of green manufacturing in achieving environmental performance (Govindan et al., 2014; Afum et al., 2020a; Afum et al., 2020b). Manufacturing companies may improve their environmental performance by improving the quality of their eco-friendly products, developing green processes and products, and incorporating green environmental concerns into their operations (Singh et al., 2020). In general, green manufacturing practices highly contribute to reduce energy consumption and manage CO_2 emissions, pollutants, and wastes will have a beneficial impact on environmental performance (Evans et al., 2009; Duflou, et al., 2012). Thus, green manufacturing can be considered as the powerful predictor environmental performance of the organization. Further, green supply chain management treated as the dimension of green manufacturing substantially impacts environmental performance (Kalyar et al., 2019). Contemporary manufacturing

organizations strive to invest more in green manufacturing practices to comply with local environmental laws and regulations, minimize pollution, and keep environmental risks at the bottom level during the production process (Mao & Wang 2018). In general, manufacturing organizations can mitigate air, water, and earth pollution by adopting green manufacturing practices such as energy conservation practices, water conservation practices, earth conservation practices, etc. Based on the above arguments it is possible to conclude that green manufacturing practices are significantly and positively influences on the environmental performance of organizations.

H_1: Green manufacturing practices are significantly and positively influences on the environmental performance of organizations.

The Relationship between Green Manufacturing Practices and Economic Performance

According to Roy and Khastagir (2016), manufacturing companies that successfully employ green manufacturing techniques make more profit and perform better economically. Researchers revealed that green manufacturing has the ability to produce the economic outcomes (e.g., profitability, market share and productivity) and operational outcomes (e.g., cost reduction, improved order delivery and flexibility, and improved product quality) (Carter, Kale, and Grimm, 2000; Rao and Holt, 2005; Zhu and Sarkis, 2004; Chung and Tsai, 2007; Vachon and Klassen, 2006).

Further, green manufacturing is considered the mandatory requirements to gain environmental certificates (eg., ISO 14001) and minimize the penalties and fines of environmental violation. Furthermore, with customers' burgeoning desire to purchase green products, manufacturing companies must develop and embrace green manufacturing practices in order to meet their customers' expectations (Ghadimi et al., 2020). Green manufacturers utilize methods, practices, and techniques that use less energy and material, reuse and recycle potentially harmful waste, and prevent pollution at the source. These procedures, practices, and strategies can result in lower costs, improved production, and a better image with consumers and the community (Inman & Green, 2018).

Overall, green manufacturing ensures the optimum utilization of resources by reducing wastages, which enriches the firms' productivity and profitability. As a result, green manufacturing practices enable businesses to improve organizational efficiency, which positively impacts financial gains (Roy &

Khastagir, 2016). Furthermore, Hui, Chan, and Pun (2001) revealed that green manufacturing practices highly contribute to building customer loyalty, increasing profitability, and improving company image. Ultimately this trend leads to upscale the economic performance of the organization. According to the above literature, this review establishes that green manufacturing practices positively and significantly impact on the economic performance of organizations as the second hypothesis of this study:

H_2: Green manufacturing practices are significantly and positively influences on the economic performance of organizations.

The Relationship between Green Manufacturing Practices and Social Performance

Social performance is the method of placing an organization's vision, purpose, objectives, and social aims into action according to widely held social values aimed at the well-being of the people manufacturing companies serve (Thomas & Kumar, 2016). In this sense, some empirical studies confirmed that green manufacturing practices have a positive and significant impact on an organization's social performance. Green manufacturing practices (e.g., green product design, green production process, green supply chain management, etc.) can enhance the positive impact on society and mitigate the negative impact on society. Further, implementing green manufacturing practices paves the way to reduce threats to employees' health and the possibility of safety-related problems and contribute to creating good working conditions (Gao & Bansal, 2013).

In addition, manufacturing organizations tend to serve the health of customers through their green products. Researchers discovered a link between an organization's environmental performance and social performance (Toke & Kalpande, 2019). As green manufacturing aims to protect the natural environment, it will also enhance the organization's social performance. Green manufacturing techniques allow companies to quickly respond to stakeholder demands regarding corporate social sustainability, enhancing company reputation and competitive advantage in today's highly competitive business environment. Therefore, this review proposes the third hypothesis:

H_3: Green manufacturing practices are significantly and positively influences on the social performance of organizations.

Hence, based on the review, this paper proposes a conceptual model that shows the relationships between green manufacturing practices and the organization's sustainable performance (see Figure 1).

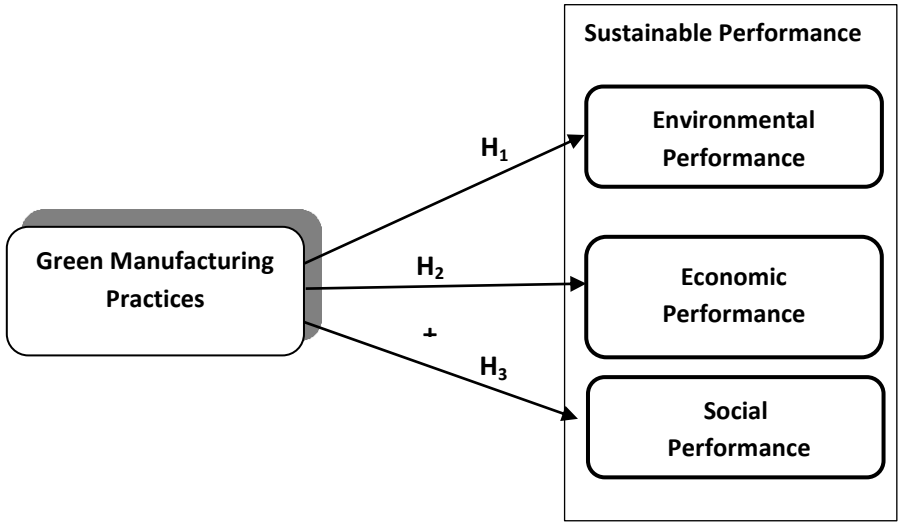

Figure 1: Conceptual Model

Method

Study Design

The industry sector of Sri Lanka is the second largest of the economy after services, and within the industry, the manufacturing sector contributed about 15.5 percent of gross domestic product (GDP) in 2020. Accordingly, the high cost of production and low-quality products are critical issues faced by local manufacturers in Sri Lanka (Central Bank Annual Report, 2018). Hence, manufacturing organizations must implement high-performance operational techniques and practices to overcome this issue. In this context, organizations strive to adapt to green manufacturing as one of the high-performance practices to ensure legal compliance, operational and environmental excellence, and gain a competitive advantage.

The study's purpose was to be analytical and predictive through testing hypotheses. The degree of researcher interference was minimal since the two variables were studied at their natural times without controlling or manipulating any of them. The research was done in the natural environment, not in an artificial environment, so the study setting was non-contrived.

The empirical data for this study were collected from manufacturing companies in the Kegalle district of Sri Lanka as researches unable to consider the 25 districts of Sri Lanka due to the time limitation of the study. There are 80 manufacturing companies exist in the Kegalle district of Sri Lanka. These 80 manufacturing companies are considered as the total population of this study. A total number of 80 questionnaires were distributed to manufacturing companies in Kegalle district. A total of 70 questionnaires were returned, yielding a response rate of 87.5%. Thus, 70 companies were selected as samples to conduct this research using a convenience sampling method (also known as availability sampling). The success or failure of these organizations is still primarily determined by the managers. Manufacturing managers have the appropriate competencies and right attitude regarding the green manufacturing of an organization. Therefore, this study considered operation/production manager as the unit of analysis for this study.

The study's purpose was to be analytical and predictive through testing hypotheses. The degree of researcher interference was minimal since the two variables were studied at their natural times without controlling or manipulating any of them. The research was done in the natural environment, not in an artificial environment, so the study setting was non-contrived.
This study is based on primary data. The data for this study was collected from respondents via a structured questionnaire. The questionnaire contained questions relating to green manufacturing practices and the sustainable performance of an organization.

Measures

Table 1 shows the measures of the study. The questionnaire used in this study was gathered and assembled from various validated instruments from the previous studies however some modifications were made in order to align with the context of the current study. The concept of green manufacturing practices consists of seven dimensions such as energy, air, water, material, waste, compliance and other green management practices. The concept of sustainability performance of an organization consists of three dimensions such as economic, social and environmental performance. This study has used a Five Point Likert Scale to measure the variables.

Table 1: Measures of the Study

Variable	Number of Question Items	Source
Green Manufacturing Practices	**29**	
Energy Management Practices (EMP)	06	Rehman and Srivastava (2011) Yacob et al. (2018);
Air Quality Management Practices (AQMP)	02	Ghadimi et al. (2020), and Zhu et al. (2008)
Water Management Practices (WMP)	04	Shang K., Lu C. and Li, S. (2010).
Material Management Practices (MMP)	05	Routroy (2009), Rehman and Srivastava (2011)
Waste Management Practices (WaMP)	05	Shang K., Lu C. and Li, S. (2010). Hofer, Cantor and Dai (2012)
Compliance Management Practices (CMP)	04	Rehman and Srivastava (2011)
Other Green Manufacturing Practices (OGMP)	03	Rehman and Srivastava (2011) Hofer, Cantor and Dai (2012)
Sustainable Performance of Organization	**11**	
Environmental Performance (EnP)	04	Abdul-Rashid et al. (2017) Hussain, Al-Aomar, and Melhem (2019)
Economic Performance (EP)	04	Abdul-Rashid et al. (2017) Hussain, Al-Aomar, and Melhem (2019)
Social Performance (SP)	03	Abdul-Rashid et al. (2017) Hussain, Al-Aomar, and Melhem (2019)

Reliability and Validity

Table 2 shows the Reliability and Validity of the Study. Reliability was measured using Cronbach's Alpha (Alpha values > 0.7) and composite reliability (values > 0.7). Average Variance Extracted (AVE) (values ≥ 0.5) was used to measure the convergent validity (Hair et al., 2014). All the instruments had a Cronbach's Alpha values above 0.70. Hence, the instruments had good reliability. Discriminant validity is established when all correlations between the constructs are significantly smaller than 1 and the squared correlations calculated for each pair of constructs are always smaller than the average

variance extracted for corresponding constructs (Fornell & Larcker, 1981; Hair et al., 2014), thereby confirming the discriminant validity presented in Table 3. As shown in Table 2, except for the AVE of energy, water and material management practices, all other values are over the agreed-upon lower limit. Energy, Water and Material management practices have a lower convergent validity (AVE), but still have an acceptable level of composite reliability. Convergent validity is adequate when constructs have an average variance extracted (AVE) of at least 0.5 (Chin 1998). It is noted that high value of AVE for all the constructs are good, but this is unlikely to occur in real data. More common magnitudes in the social sciences are low to moderate communalities (or AVEs) of 0.40 to 0.70. Suppose an item has an AVE (communality) of less than 0.40. In that case, it may either (a) not be related to the other items, or (b) suggest an additional factor that should be explored (Velicer and Fava 1998; Costello and Osborne 2005). A Study conducted by Wijekoon and Galahitiyawe (2016) also applied the same method in ensuring the convergent validity. Hence, the reliability and validity of the measurement are assured.

Table 2: Reliability and Validity of the Study

Variable	**Reliability-** Cronbach's Alpha Value	**Composite Reliability**	**Average Variance Extracted (AVE)**
Green Manufacturing Practices			
Energy Management Practices	0.845	0.84	0.48
Air Quality Management Practices	0.710	0.73	0.58
Water Management Practices	0.738	0.71	0.44
Material Management Practices	0.793	0.79	0.45
Waste Management Practices	0.781	0.83	0.53
Compliance Management Practices	0.813	0.86	0.62
Other Green Manufacturing Practices	0.891	0.88	0.72
Sustainable Performance of Organization			
Environmental Performance	0.792	0.83	0.55
Economic Performance	0.796	0.87	0.63

Social Performance	0.887	0.89	0.74

Source: The Authors

Table 3: Discriminant Validity of the Study

	EMP	AQMP	WMP	MMP	WaMP	CMP	OGMP	EnP	EP	SP
EMP	**0.48**									
AQMP	0.18	**0.58**								
WMP	0.11	0.04	**0.44**							
MMP	0.05	0.00	0.27	**0.45**						
WaMP	0.15	0.04	0.00	0.00	**0.53**					
CMP	0.06	0.06	0.00	0.00	0.01	**0.62**				
OGMP	0.07	0.03	0.01	0.08	0.03	0.10	**0.72**			
EnP	0.09	0.05	0.20	0.05	0.05	0.11	0.19	**0.55**		
EP	0.04	0.00	0.29	0.89	0.01	0.00	0.07	0.06	**0.63**	
SP	0.22	0.05	0.09	0.19	0.10	0.02	0.00	0.16	0.06	**0.74**

Source: The Authors

Data Analysis and Techniques

Statistical Package for Social Sciences (SPSS) was used to analyse the primary data collected from the respondents. The simple regression analysis was utilized to test the functional relationships among the variables which were with regard to the three hypotheses numbering H1 to H3. *R* is the correlation coefficient between the real data points and the values predicted by the model. *R-squared* explains how much of the variation in the dependent variable is explained by the independent variables in the model. *Adjusted R-squared* is used to compensate for the addition of variable to the model. The Anova analysis provides the *f-test* value for the regression analysis. Anova analysis gives an indication of the significance of the model. If the *f* ratio is significant, the regression equation has predictive power, which means that we have at least one statistically significant variable in the model. In contrast, if the f-test is not significant, none of the model variables is statistically significant, and the model has no predictive power. If $P \leq 0.05$, alternate hypothesis is supported and can be used to make predictions. If $P \geq 0.05$, the alternate hypothesis is rejected (Stockemer, 2019).

Findings

Profile of the Respondents

An analysis of the descriptive statistics of the sample of valid questionnaires showed that 55.7 percent of the respondents are female and 44.3 percent are

male; 60 percent of them were married, and 40 percent were single. The results also revealed that 38.6 percent of them were owners, 10 percent of them were executive officers, 32.9 percent of them were managers (Accounting and Finance, Marketing, Operations and Production), 5.7 percent of them were engineers, 10 percent of them were assistant managers and 2.8 percent of them were in the other responsible positions. All of them are aware of the concept of green manufacturing practices and sustainable performance of organization.

Data Presentation and Analysis

The first objective study was to identify the usage level of green manufacturing practices and sustainable performance of selected manufacturing companies in the Kegalle district of Sri Lanka. This study used descriptive analysis to achieve the first objective.

Table 4: Descriptive Statistics for Variables

Dimension	Mean	Standard Deviation
Energy Management Practices	2.84	0.86
Air Quality Management Practices	3.81	0.79
Water Management Practices	3.31	0.75
Material Management Practices	2.75	0.95
Waste Management Practices	3.16	0.64
Compliance Management Practices	3.37	0.97
Other Green Manufacturing Practices	2.80	1.08
Green Manufacturing Practices	**3.15**	**0.48**
Environmental Performance	3.35	0.86
Economic Performance	3.08	1.06
Social Performance	2.91	0.87
Sustainable Performance of Organization	**3.11**	**0.68**

(Note: Mean value range: $1 \leq X \leq 1.80$: Very Low, $1.80 < X \leq 2.60$: Low, $2.60 < X \leq 3.40$: Moderate, $3.40 < X < 4.20$: High, and $4.20 < X < 5.00$: Very High: *Source: Masri and Jaaron, 2017)*

(Source: Survey Data)

The variable of green manufacturing practices includes seven dimensions which are: (1) Energy management practices, (2) Air quality management practices, (3) Water management practices, (4) Material management practices, (5) Waste management practices, (6) Compliance management practices and (7) Other green management practices. The mean, standard deviation, individual score of dimensions and mean and standard deviation for the variable are shown in Table

4. The average value of the green manufacturing practices (mean value is 3.15) indicates that selected manufacturing companies were implemented green manufacturing practices at a moderate level.

The variable of sustainable performance includes three dimensions which are: (1) Environmental performance, (2) Economic performance, and (3) Social performance. The mean, standard deviation, individual score of dimensions and mean and standard deviation for the variable are shown in Table 4. The average value of the sustainable performance (mean value is 3.11) indicates that there was a moderate level of sustainable performance recorded in surveyed companies.

The study's second objective was to examine the impact of green manufacturing practices on sustainable performance of the organization in selected manufacturing companies in the Kegalle district of Sri Lanka. Simple regression analysis was applied to test the three hypotheses related to this objective.

Test of Hypotheses (H1-H3)

Table 5:Test of Hypotheses

	H1	**H2**	**H3**
R	.563[a]	.480[a]	.527[a]
R square	.317	.230	.277
Adjusted R Square	.307	.219	.267
Std. Error of the Estimate	.71684	.93264	.74796
F	31.612	20.340	26.109
Sig.	.000[b]	.000b	.000[b]

H1: Dependent Variable: Environmental Performance Predictors: (Constant), Green Manufacturing Practices; H2: Dependent Variable: Economic Performance; Predictors: (Constant), Green Manufacturing Practices; H3:Dependent Variable: Social Performance Predictors: (Constant), Green Manufacturing Practices

Table 5 presents the R statistics as 0.563. It is empirically and statistically evident that green manufacturing practices have a strong positive and significant relationship with environmental performance. Adjusted R Square statistics indicated that the 31.7 % of the variation in the environmental performance is explained is explained by green manufacturing practices.

The *f*-value is 31.612 and the corresponding significance level is 0.000 which is below than 0.5. Thus, it is possible to conclude that green manufacturing practices influence on environmental performance of organization.

Table 5 presents the R statistics as 0.480. It is empirically and statistically evident that green manufacturing practices have a medium positive and

significant relationship with economic performance. Adjusted R Square statistics indicated as 21.9 %. It indicates that about 21.9 percent of the variance (R Square) in the economic performance is explicated by green manufacturing practices. The *f*-value is 20.340 and the corresponding significance level is 0.000 which is below than 0.5. Thus, results conclude that green manufacturing practices positively and significantly positively impact on economic performance of organization.

Table 5 presents the R statistics as 0.527. It is empirically and statistically evident that green manufacturing practices have a strong positive and significant relationship with social performance. Adjusted R Square statistics indicated that the 26.7 % of the variation in the social performance is explained is explained by green manufacturing practices. The *f*-value is 26.109 and the corresponding significance level is 0.000 which is below than 0.5. Thus, results conclude that green manufacturing practices positively and significantly positively impact on social performance of organization. The regression analysis supported substantially to accept the three hypotheses. It is empirically and statistically evident that green manufacturing practices have positive and significant impact on environmental performance, economic performance and social performance of organization. In overall empirical findings of the study revealed that green manufacturing practices have positive and significant impact on sustainable performance of organization.

Discussion and Conclusion

The manufacturing industry has a greater obligation than other industries to demonstrate and disclose their economic, social, and environmental performance in order to ensure organizational sustainability. As a result, manufacturing firms are placing extra focus on implementing green manufacturing practices, which have a substantial impact on economic, social, and environmental outcomes. This study examines the impact of green manufacturing practices on sustainable performance of organizations in selected manufacturing companies which are operating in the Kegalle district of Sri Lanka. The study's empirical findings revealed that green manufacturing practices are significantly and positively influence on sustainable performance of organizations (economic, social and environmental performance). In other words, green manufacturing practices have the potential to equally improve the economic, social, and environmental performance of manufacturing organizations. An empirical study conducted by Kalhari et al., (2019) also proved the same positive association between green manufacturing practices

and perceived financial performance of the 36 manufacturing companies in Sri Lanka. The findings of the current study also comply with a study conducted by Sezen and Chankuaya in 2013. According to their findings, green manufacturing applications (practices) have a significant positive impact on environmental performance and social performance of the surveyed organizations in Turkey.

In this sense, green manufacturing practices support to achieve economic gains via ensuring the efficient and effective utilization of organizational resources. Further, environmental excellence is highly possible by implementing green manufacturing practices (e.g., air management practices, water management practices, energy management practices, etc.), which effectively mitigate or ensure zero water, air, and pollution. In addition, the social performance of an organization is guaranteed by the green manufacturing practices by ensuring the well-being of stakeholders who are directly or indirectly connected with the organizations (e.g., employees, customers, suppliers, government and media etc.). Therefore, as green manufacturing practices can equally contribute to the economic, social and environmental performance of organizations, they can be labelled as sustainable manufacturing practices. The findings of the study are consistent with recent studies (e.g., Toke and Kalpande, 2019; Afum et al., 2020a) which also revealed the positive and significant relationship between green manufacturing practices and sustainable performance of organizations.

Implications and Future Research Directions

The findings of this study have significant practical implications. To achieve organizational sustainability, contemporary organizations are expected to concentrate equally on economic, environmental, and social performance. More and more manufacturing companies are attempting to enhance sustainable performance via the use of relevant practices, initiatives, and processes. Green manufacturing practices can be seen as a critical tool for manufacturing companies to enhance their economic, environmental, and social performance while ensuring their organizational sustainability. When senior management intends to enhance organizational sustainable performance, they must consider economic, environmental, and social performance equally. As the findings show, green manufacturing practices may improve economic, environmental, and social performance, all of which are necessary for greater organizational sustainable performance. As a result, managers who are adopting green

manufacturing practices and want to know how green manufacturing might assist organizations attain organizational sustainability can benefit from this study. The outcomes of this research will motivate manufacturing companies' managers to develop and sustain green manufacturing practices across the Sri Lankan manufacturing sector. This research also encourages manufacturing professionals to experiment with innovative green manufacturing techniques and evaluate their effects on their companies' economic, environmental, and social performance.

This study has significant implications for research. This research makes a substantial contribution to the area of green manufacturing research. Although there have been a few studies that have looked at the content of green manufacturing in Sri Lanka, this research contributes to the body of knowledge by documenting the impact of green manufacturing techniques on economic, social, and environmental results. The study's primary objective was to examine at the influence of green manufacturing practices on the sustainable performance of organizations. This study was done to discover how green manufacturing practices help organizations improve their economic, social, and environmental performance. Therefore, the study's findings contribute to green manufacturing practices and organizational sustainability literature.

The current research is a cross-sectional study. As a result, future researchers should confirm the current findings using longitudinal designs rather than cross-sectional designs for establishing casual assumptions based on previous theory and empirical evidence. Furthermore, only a quantitative research design is used in this study. As a result, future researchers may consider gathering deeper data from respondents. The use of qualitative and quantitative methods would provide more depth and richer explanations regarding the relationship between green manufacturing practices and sustainable performance of organizations. In addition, future researchers may look at the factors that influence the deployment of green manufacturing in the industry. Furthermore, the findings' generalizability is hampered by the study's sample being limited to manufacturing companies in a selected district in Sri Lanka. Hence, future studies can be extended nationwide.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

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Appendix: Questionnaire

Green Manufacturing Practices						
Energy Management Practices						
1	My firm uses low voltage and energy efficient machineries.	1	2	3	4	5
2	My firm installed LED panel.	1	2	3	4	5
3	My firm shares or provides energy saving information to employees.	1	2	3	4	5
4	My firm has moved to cloud computing in order to save energy.	1	2	3	4	5
5	My firm practices automatic sleeping systems for ICT equipments.	1	2	3	4	5
6	My firm has fixed solar panel system.	1	2	3	4	5
Air Quality Management Practices						
7	My firm has a mechanism to control or reduce noise pollution.	1	2	3	4	5
8	My firm has a mechanism to control or reduce air pollution.	1	2	3	4	5
Water Management Practices						
9	My firm uses recycled water.	1	2	3	4	5
10	My firm discharges waste water outside after filtering.	1	2	3	4	5
11	My firm has water tanks to save/stock rain water.	1	2	3	4	5
12	My firm shares or provides water saving information and knowledge to the employees.	1	2	3	4	5
Material Management Practices						
13	My firm has efficient material management systems.	1	2	3	4	5
14	My firm uses environmental friendly materials.	1	2	3	4	5
15	My firm produces goods only after taking valid orders.	1	2	3	4	5
16	My firm purchases raw materials from the suppliers who comply with green management practices.	1	2	3	4	5
17	My firm uses environmental friendly packing materials.	1	2	3	4	5
Waste Management Practices						
18	My firm categorizes waste before handing over.	1	2	3	4	5
19	My firm produces by-products from wasted or unused materials.	1	2	3	4	5
20	My firm discharges chemicals outside after applying appropriate treatment.	1	2	3	4	5
21	My firm practices 'green travelling' program.	1	2	3	4	5
22	My firm practices the concepts of reduce, reuse, and recycle.	1	2	3	4	5
Compliance Management Practices						
23	My firm develops green behavior among employees, suppliers, and customers.	1	2	3	4	5
24	My firm has achieved certain ISO certifications such as ISO 9001, ISO 22000, ISO 14001 and ISO 50001	1	2	3	4	5
25	My firm has sound green or environmental management systems and policies.	1	2	3	4	5
26	My firm compliance with global/national green/environmental rules and regulations.	1	2	3	4	5

Other Green Manufacturing Practices						
27	My firm collaborates with organizations for develop green practices among society or community.	1	2	3	4	5
28	My firm has engaged in getting eco-friendly business certifications.	1	2	3	4	5
29	My firm conducts green vision programs among the employees.	1	2	3	4	5
Sustainability Performance						
Environment Performance						
30	My firm has reduced CO_2 emission.	1	2	3	4	5
31	My firm has reduced water usage.	1	2	3	4	5
32	My firm has reduced energy consumption.	1	2	3	4	5
33	My firm has improved compliance with environmental standards when compared with last year.	1	2	3	4	5
Economic Performance						
34	My firm has improved market share.	1	2	3	4	5
35	My firm has improved company image.(i.e. company is seen as a green company)	1	2	3	4	5
36	My firm has improved company's position in the marketplace.	1	2	3	4	5
37	My firm has increased profitability.	1	2	3	4	5
Social Performance						
38	My firm has improved relationships with the community and stakeholders.	1	2	3	4	5
39	My firm has Improved work safety work environment.	1	2	3	4	5
40	My firm has improved living quality of surrounding community.	1	2	3	4	5