

## The Effect of Green Supply Chain Practices on Operational Performance: Bench-marking between Shell and Co-operation Petroleum Company in Egypt

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### Abstract

This study aimed to determine the *applicability* to which green supply chain practices employed by Shell and Co-operation Petroleum Company in Egypt. Additionally, the impact of Green Supply Chain practices on the operational performance of each company. The results, based on benchmarking, were statistically analyzed by Fischer analysis. Concerning the parameters of company's practices of green procurement, the results revealed highly significant differences ( $p < 0.0001$ ) between Shell and Co-operation Petroleum Companies. Regarding of company's green manufacturing practices, the results revealed highly significance differences ( $p < 0.0001$ ) between Shell and Co-operation Petroleum Companies in produce products that have packages using life cycle assessment to evaluate environmental load, replacing hazardous substances with that are environmentally friendly, minimizing the use of materials in packaging, encouraging ruse of products and recycled materials, reducing the size of packaging, and cooperating with suppliers to standardize packaging between the both company. Referring to the company's practices of reverse logistics, the results revealed highly significant differences ( $p < 0.0001$ ) in dealing with disposal, processing returned merchandise, and repackaging product. Regarding the Company's operational performance with respect to the implementation of green supply chain practices the results revealed highly significant differences ( $p < 0.0001$ ) in quality, safety, delivery, and flexibility between Shell and Co-op companies. This project lustrated that green supply chain practices have a profound effect on the operational performance in Shell Company making it number one in the lubricant industry in Egypt.

**Keywords:** Green supply chain practices; Shell Egypt; Co-operation Petroleum Company; Statistical methods; Operational performance.

### 1. Introduction

The concept of global warming and environmental pollution has made many companies adopt the concept of green supply chain management (GSCM) to improve the operational performance of enterprises and therefore their products according to environmental requirements, aiming to conserve scarce resources and energy (Hsu and Hu; 2008; Lee, Kim, and Choi, 2012). Successful management of the green supply chain requires the identification of effective and critical practices to obtain the value within the supply chain that affects operational performance and achieves competitive advantage by developing internal processes and relationships with suppliers and customers (Ayuso, Roca, and Colomé, 2013). So this study came to explore the impact of green supply chain practices in the operational performance of Shell and Co-operation Petroleum Companies in Egypt in the field of lubricants. The previous studies on the evaluation of operational performance are mostly under-researched. Thus, a study is urgently needed to determine how the operational performance of companies in the lubricant industry is affected by the implementation of green supply chain practices.

## 2. Literature Review

Green manufacturing involves many processes. It begins with product design in a way that reduces resource and energy consumption, product design with recyclability parts and components, as well as avoiding toxic substances (Zhu, Sarkis, and Geng, 2005). GSCM divided into three processes; the green procurement, the green manufacturing, and the reverse logistics. The green procurement is concerned with the purchase of environmentally friendly products that can reuse after the end of the product life cycle. The green manufacturing "concerns with" the use of inputs with low environmental impacts or the reduction of all that has a negative impact on the environment, allowing the use and optimization of resources and put them in their proper place. The reverse logistics deals with the recovery process of unsold products from retail and distribution outlets or products used by customers for recycling or disposal (Ninlawan et al., 2010).

Sabegh, Ozturkoglu, and Kim (2016) concluded that there is a strong relationship between third-party logistics practices and corporate performance for a green supply chain. A significant effect on economic, environmental and intangible company performance was concluded by (Jemetal, 2014). Nazam et al. (2015) proposed a multi-standard decision-making model to assess potential risks during the implementation of the green supply chain in the textile industry. The study will be ended up using this model from researchers and managers to help them assess multiple risks when implementing green supply chain processes.

Khalili and Alinezhad (2018) designed a model to verify the efficiency of green supply chain using packaging data envelopment analysis (DEA) based on the Malmquist Productivity Index (MPI) according to the input and output indicators of the Balanced Scorecard. The results concluded that the proposed model helped managers to make accurate decisions in verifying the efficiency of the green supply chain.

The green procurement process ensures that the purchased items have desirable environmental attributes such as reuse, recycling and non-toxic materials (Sarkar, 2012). In addition, green purchases can also address waste reduction issues, replace materials by obtaining appropriate sources of raw materials and reduce waste of hazardous materials. Supplier participation is critical to achieving environmental objectives (Miemczyk, Fohnsen, and Macquet, 2012).

Reverse logistics are the process of assembling the products used by customers and returning them to manufacturers for reprocessing, through distributors (Xie and Breen, 2012).

Operational performance is the end result of all activities, tasks, and duties of the Company. The comparison of the results of the activities and practices of the company with objectives was emphasized by some authors as Cousins, Lamming, and Bowen (2004). Thus, this study identifies operational performance as the final result of the employees and the activities of the company, which illustrate operational outputs represented by the quality, safety, flexibility, and delivery.

## 3. Methodology

### 3.1. Data Collection

In this study, Descriptive research design, based on two types of benchmarking; best-in-class and operational benchmarking, was used to explain the relationship between the green supply chain practices and operational performance between Shell and Co-op companies in Egypt.

The researcher involved three managers in both companies; namely; Procurement Manager, Production Manager, and Logistics Manager. Eighteen-item- questionnaire was used for collecting data and was guided by the objectives of the study. The questionnaire scale was in the range from – to ++++ where respondents required to indicate their views on this scale. This scale was chosen by the researcher to allow the respondents to express their views more clearly and openly.

### 3.2. Data Analysis

In this study, statistical analysis was performed using a statistical program (GMP for Windows version 5.1, SAS Institute, Cary, NC, USA). For data analysis, the Fisher's exact test was used to compare between Shell and Co-operation Petroleum Companies to assess the impact of green supply chain practices on operational performance; quality, safety, delivery and, flexibility. Data were analyzed as - = 0, + = 25, ++ = 50, +++ = 75, ++++ = 100. (++++)= very large applied and impact, (++++) = large applied and impact, (++) = moderate, (+) = small applied and impact, and (-) = not at all. The results were considered significant at  $P < 0.05$ . This statistical analysis was chosen to achieve the objectives of the study.

## 4. Results

### 4.1. The applicability of green supply chain practices employed by Shell and Co-operation Petroleum Companies showed in Table 1.

**Table 1.** Comparison between Shell Company and Co-operation Company in applicability of GSC Practices parameters

Parameters of GSC Practices	Shell Company	Co-operation Company
Require Suppliers to have ISO 14001	75***	25
Purchasing Materials that Contain Green Attributes	75***	0
Evaluate Suppliers on Specific Environmental standards	75***	0
Purchasing Products that are made Using Recycled Packages	75***	0
Producing Products that have Packages which can be Recycled	75***	25
Using Life Cycle Assessment to Evaluate Environmental load	75	75
Replacing Hazardous Substances with that are Environmentally Friendly	66***	33
Minimizing the Use of Materials in Packaging	75***	0
Encourage Reuse of Products and Recycled Materials	75***	25
Reducing the Size of Packaging	75***	0
Cooperating with Suppliers to Standardize Packaging	75***	0
Dealing with Disposal	66***	33
Processing Returned Merchandise	75***	25
Repackaging Product	75***	0

The results of Table 1 revealed highly significance difference ( $p < 0.0001$ ) in all parameters of green supply chain practices except the parameter of using Life cycle assessment to evaluate environmental load showed the non-significant difference between Shell Company and Co-operation Company.

#### 4.2. Operational Performance in relation to Green Supply Chain Practice implementation

**Table 2.** Impact of GSC Practices on Operational Performance between Shell and Co-operation Companies

Parameter of Operational Performance	Shell Company	Co-op Company
Quality	75***	25
Safety	66***	33
Delivery	75***	25
Flexibility	75***	0

The results of the impact of GSC practice on operational performance showed in Table 2 and Figures (1-4). The results showed that the quality (Figure 1), safety (Figure 2), delivery (Figure 3), and flexibility (Figure 4) of Shell company are much higher ( $p < 0.0001$ ) than those of the Co-operation company.

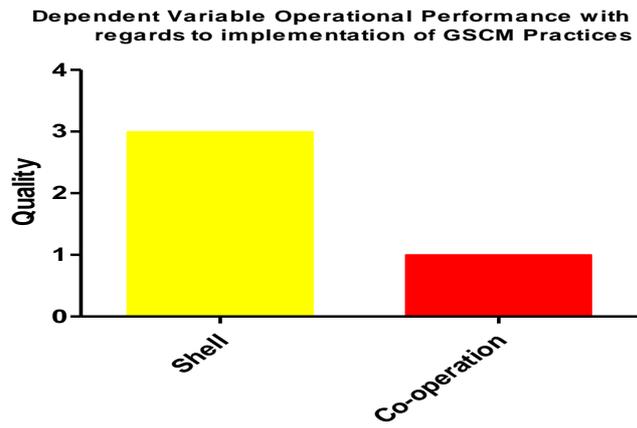


Figure 1. Comparison between Shell Company and Co-operation Company in Quality

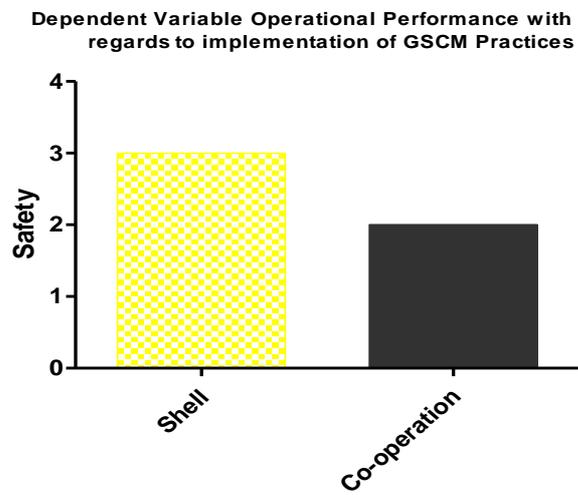


Figure 2. Comparison between Shell Company and Co-operation Company in Safety

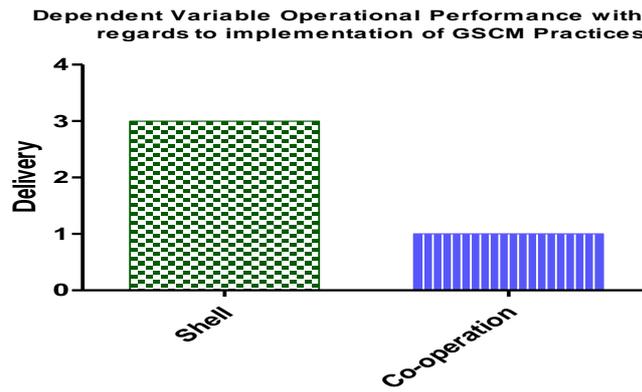


Figure 3. Comparison between Shell Company and Co-operation Company in Delivery

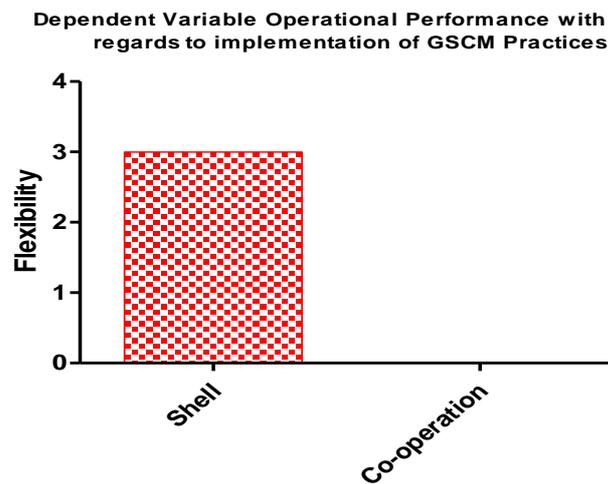


Figure 4. Comparison between Shell Company and Co-operation Company in Flexibility

### Operational Performance in relation to GSC Practice implementation in Shell Company

- Quality: All shell facilities are ISO 9001 certified to make sure that products are conforming to the standards claimed by the company
- Safety: The concept of safety is one amongst the company's goals. The strict implementation of the safety in Shell Company led to a significant reduction in accident rates which had a positive effect in maintaining the process with efficiency and safety.
- Delivery: The foremost necessary KPI in the supply chain within Shell is called OTIF (On time and in full).
- Flexibility: Shell forever adheres to the customers' needs that mean these needs meet with a high kind of flexibility in numerous operations to be able to meet customer demand or desires.

### 5. Conclusion

The study concluded that Shell used green supply chain management practices. Statistical analysis showed that GSC practices had a strong impact on operational performance and how these practices had positive effects on Shell's operational performance; it is generally possible to conclude that green supply chain practices can help companies in the lubricant industry to improve operational performance. At a time when Co-op Petroleum Company has not applied green supply chain practices to the same level as Shell, it has a negative impact on the company's operational performance.

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