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IDENTIFYING THE DRIVERS FOR GREEN SUPPLY CHAIN IMPLEMENTATION

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ABSTRACT

Green supply chain management required use of environmentally friendly raw materials that transformed into products that used for considerable period without caused damage to the environment. The raw material and inputs used in production of goods and reused, recycled at end of the product life cycle thus made the process environmentally sustainable. Green supply chain management (GSCM) was quite new topic in operations and supply chain management. This study aimed to explore key themes such as green operations management and manufacturing, reverse logistics and waste management. The population was selected mostly included Saudi Arabian national followed by expatriate workers from countries such as India, Philippines and Pakistan who worked in the supply chain function in various companies in Kingdom of Saudi Arabia. The survey was provided to 100 potential respondents which only 44 real respondents had involved in this study. The data was collected from Aramco company employer in Saudi Arabia that looks into government compliance and provided result and conclusions on the factors that motivated shift towards green supply chain management.

INTRODUCTION

Nowadays, supply chain management has widely used in various industry sectors [1]. Supply chain management (SCM) is planning, arrangement, control and realization of product flow, ranged from designing and purchasing via production and distributed to the final customer [2, 3]. The movement of goods and materials from one source to the other and to end consumer was supply chain from beginning to the end. The value is produced when products and raw materials are moved by using different processes and activities by individuals who facilitate the coordination [4]. Latest supply chain

management evolution practices involve outsourcing, supplier partnership, cycle time compression, information technology sharing and continuous process flow [3].
The materials flow can be an upstream or downstream flow depending on the connection. Whole supply chain is a network that consists of suppliers, procurers and purchasers, manufacturers, warehousing services, transport facilitation, distribution network and outlets that retail and whole sales the end product with inventory management centres to store raw materials, work-in-progress and finally finished product.

Green supply chain management has become widely popular terms in all management and supply chain circles around the world. GSCM have ranged from green purchasing to integrated supply chains from supplier, manufacturer, customer and reverse logistics which is closing the loop [5]. Cooperative supply-chain environmental management is introduced by Sharfman which signifying activities in which the main firm and its suppliers collaborate to reduce negative environmental impacts along the product life [6]. GSCM is highly demand and important due to primarily to the environment deterioration, inefficient waste management and diminishing raw material resource [7].

The increasing in government regulation and stronger public mandates for environmental accountability had brought these issues into the executive suites and onto strategic planning agendas [3]. The organization tried to incorporate GSCM in China have slightly improved environmental and operational performance and GSCM have not yielded satisfactory improvement in economic performance cited that added complexity and increased costs [8].

Companies had been moving away from traditional forward logistics into reverse logistics which defined as process in which the manufacturer accepts products that previously shipped for recycle and remanufactured thus products not going to landfills but rather their components are recycled and used in new products [9,10]. The reverse logistics is different than forward logistics. The forward logistics include series of activities in converting raw material to finished product process while reverse logistics is concerned on the recovery of returned products from customer to recovery point [11].

In reverse logistics, there are different decision makers such as government, buying companies and suppliers who are responsible for several decisions [12]. In reverse logistics, the manufacturer accepts products that were shipped previously starting from the consumption point and go onto recycling and remanufacturing.

Meanwhile, life cycle analysis is mapping the stages of the production process from procurement and extraction of raw materials, delays in transport into the production facility, production, distribution, and remanufacturing, recycling and final disposal of the product. A good life cycle analysis maps out the time takes from procuring raw materials and production into the final decay of the product.

Organization has GSCM practices have competitive edge in comparison to companies that creates negatives externalities in the world. Therefore, this study aimed to explore key themes such as green operations management and manufacturing, reverse logistics and waste management.

METHODOLOGY

The research design referred to the overall research strategy that explored parts of the study was conducted to form a well -balanced and critical methodology to address a study problem.

The data collected was presented in a quantitative format with findings and conclusions. Quantitative data was best known currency available for the study. The quantitative data was given the opinion polls of allows companies to claim some customers would prefer product X over Y.

The population was selected mostly included Saudi Arabian national followed by expatriate workers from countries such as India, Philippines and Pakistan who worked in the supply chain function in various companies in Kingdom of Saudi Arabia. The survey was provided to 100 potential respondents which only 44 real respondents had involved in this study. The demographic selected only worked in Saudi Arabia at time frame the survey was conducted.

The data required was collected used online survey utilized Google forms service by Google. This form helped to illicit responses as respondents who received the survey was able to attempt at leisurely pace when time permitted.
The survey was compiled in a way that easily understood by the people whose main language was not English. Most Saudis and expatriates did not speak English in day-to-day situation was considered. The survey respondents who undertook the survey was pre-screened used convenient sampling method. All respondents were supply chain professionals in different companies.

RESULT AND DISCUSSION

Result

In Figure 1, about 65.9% of respondents were aged more than 40 years old. Meanwhile, 11.4% of respondents were aged between 23 years and 30 years old and 22.7% of respondents were aged between 31 years old and 40 years old.
In Figure 2, 34.1% of the respondents have estimated that the company income was less than 1500000SR. Meanwhile, 20.5% of the respondents have estimated that company income was between 1500000SR and 30000000SR. In addition, 45.5% of respondents had estimated the company income were more than 30000000SR.

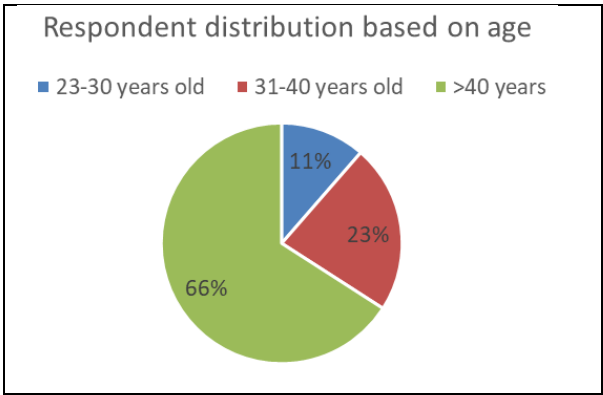

Figure 1: Respondent distribution based on age.

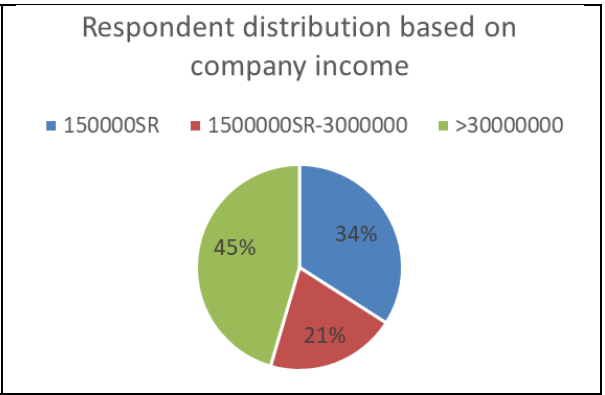

Figure 2: Respondent distribution based on company income estimation.

In Figure 3, 13 of the respondents strongly agreed and 12 of respondent agreed on reduce or avoid the threat of current or future government environmental legislations. Meanwhile, a respondent disagreed and 5 of respondents were strongly disagreed on governmental regulatory threat. In second question, 10 of respondents were strongly agreed and 14 of respondents slightly agreed on government inspections or audits on the firm to comply with environmental laws and regulations. In third question, there were many environmental regulations or restrictions imposed by the government. Many respondents were slightly agreed on number of environmental regulations imposed by government.

There were 20 respondents were slightly agreed and 5 of respondents were strongly disagreed on customer frequency in requiring the firm to adopt green supply chain initiatives as shown in Figure 4. There were 9 of respondents strongly agreed and 8 of respondents were agreed on customers of the corporation had expressed having a clear policy statement on the company commitment to protect the environment. In addition, 12 of respondents were agreed and 20 of respondents were slightly agreed on company encouragement to adopt green supply chain initiatives.

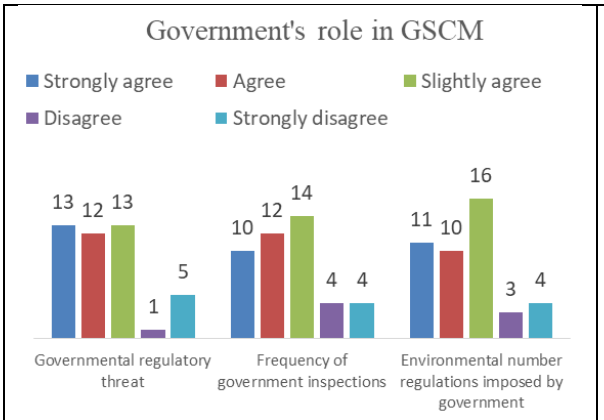

Figure 3: Government's role in GSCM

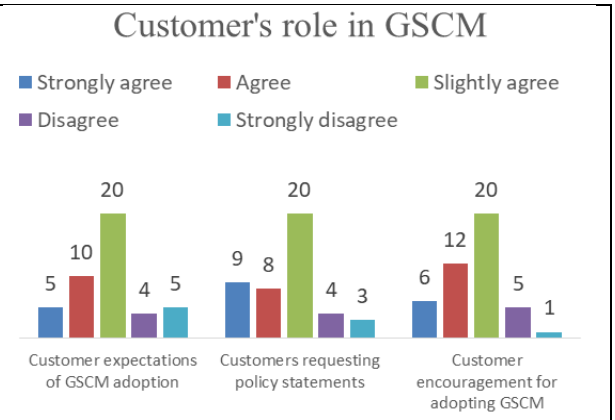

Figure 4: Customer's role in GSCM

Meanwhile, 15 of respondents were strongly agreed and 13 of respondents are agreed on company belief in promoting society welfare as shown in Figure 5.

There were 16 of respondents strongly agreed and 12 of respondents are slightly agreed that society health and safety are major concern in the firm. In addition, 18 of respondents agreed and 5 of respondents are disagreed on the firm belief based on society expectation. T

Four respondents were strongly agreed and 20 respondents agreed whether green supply chain initiatives are considered by the firm as marketing strength. Furthermore, 13 respondents were slightly agreed and 4 respondents disagreed whether green supply chain initiatives are generally considered as a way to improve the firm image. A respondent is disagreed and 3 respondents were strongly disagreed toward industry belief on benefits and costs of green supply chain initiatives. Besides, 14 respondents were strongly agreed and 16 respondents slightly agreed on green supply chain initiatives are right thing to achieve business objectives as shown in Figure 6.

There were 11 respondents strongly agreed and 15 respondents agreed on provided designs specifications to suppliers that included environmental requirements when purchasing items. There were 9 respondents strongly agreed and 16 respondents were agreed on the supplier required to develop and maintain an environmental management system as shown in Figure 7. Besides, 9 respondents agreed and 17 respondents slightly agreed that supplier need to have an Environmental Management System (EMS) certification such as ISO 14001. In addition, 10 respondents were strongly agreed and 12 respondents agreed on supplier were evaluated based on specific environmental criteria.

In Figure 8, 13 respondents agreed and 14 respondents slightly agreed on packaging used have recyclable aspects for first question. Meanwhile, 7 respondents strongly agreed and 14 respondents were slightly agreed whether products that reduced energy consumption during usage. There were 5 respondents disagreed and only a respondent strongly disagreed that packaging was made to be reusable. Besides, 12 respondents strongly agreed and 10 respondents agreed on company tried to minimize the material used in the packaging.

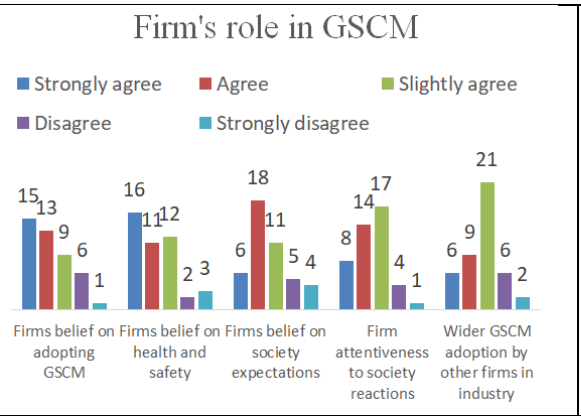

Figure 5: Firm's role in GSCM

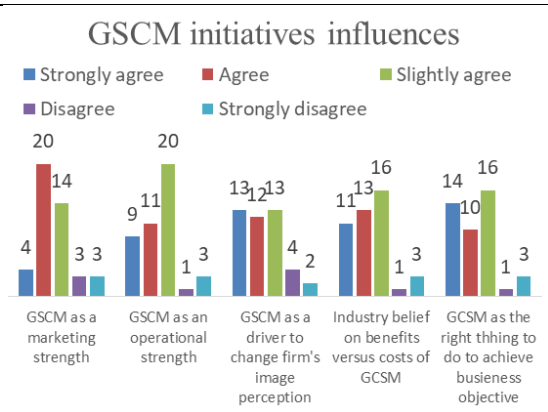

Figure 6: Green supply chain initiative influences.

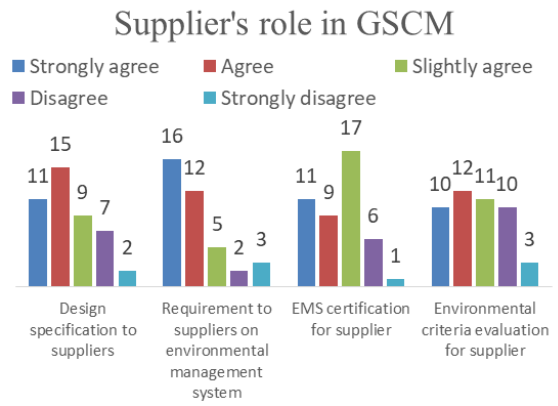

Figure 7: Supplier's role in GSCM.

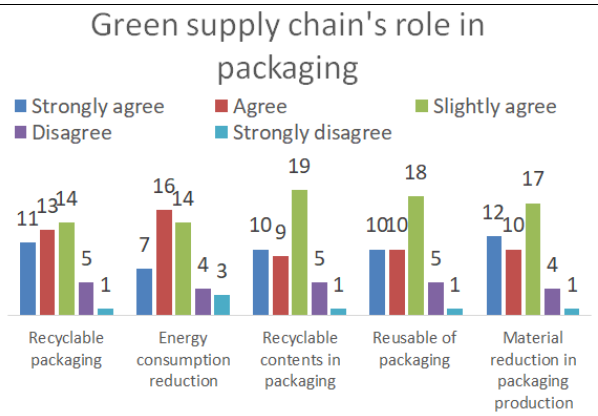

Figure 8: Green supply chain role in packaging.

There were 9 respondents strongly agreed and 11 respondents agreed that their company collected used products for recycle, reclaim and reuse. For packaging collection to reuse and recycling, 8 respondents strongly agreed and 9 respondents agreed that used packaging was collected from customers for reuse and recycling as shown in Figure 9. Meanwhile, 7 respondents strongly agreed and 8 respondents agreed that the company required the supplier to collect their packaging materials. There were 7 respondents strongly agreed and 16 respondents slightly agreed that the company returns products to supplier for recycling, retaining or remanufacturing. For packaging returns to recycle and reuse, 8 respondents strongly agreed and 8 respondents agreed to return the packaging to supplier to reuse or recycle.

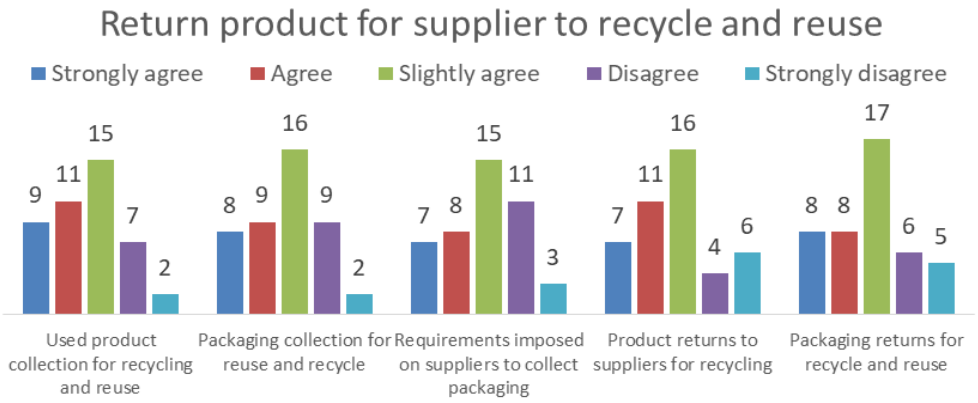

Figure 9: Return Product for Supplier to Recycle and Reuse.

This analysis aimed with consistent result. A "high" value for alpha did not imply that measure was one-dimensional. Cronbach's α expressed as number between 0-1.

Table 1 tabulates the customer pressure had Cronbach's Alpha was 0.844, hence CUS had acceptable level of reliably and acceptable value. The Cronbach's Alpha of competitor pressures, sociology-cultural responsibility, green purchasing, design for environment, and reverse logistics were 0.817,

0.915, 0.926, 0.942, and 0.941 respectively, which acceptable. Meanwhile, the Cronbach's Alpha of regulatory measures was 0.709 which rejected.

Table 1: Reliability Test of The Variables

Variable	Cronbach's Alpha
Customer pressure (CUS)	0.844
Competitor pressures (COM)	0.817
Sociology-cultural responsibility (SOC)	0.915
Green purchasing	0.926
Design for environment (ECO)	0.942
Reverse logistics (RVE)	0.941
Regulatory measures (REG)	0.709

In Table 2, linear regression analysis for green purchasing as drivers that influenced supply chain decisions was positively related. The regression had sum of square of 29.913 and mean square of 7.478. Meanwhile, residual had sum of squares of 13.742 and mean square of 0.371.

Table 3 showed a positively related linear regression analysis for design for environment as drivers that influenced supply chain decisions. The regression had sum of squares of 24.253 and mean square of 6.063. Meanwhile, residual had sum of squares of 14.532 and mean square of 0.393.

The linear regression analysis for reverse logistics as drivers that influenced supply chain decisions was showed in Table 4, which was positively related. The regression had sum of squares of 17.725 and mean squares of 4.431. Besides, residual had sum of squares of 27.791 and mean square of 0.751.

Therefore, the dependent variables had proved included green purchasing, design for environment and reverse logistics.

Table 2: Linear Regression Analysis for Green Purchasing as Drivers That Influenced Supply Chain Decisions: Positively Related

Model 1	Sum of squares	df	Mean square	F	Sig.
Regression	29.913	4	7.478	20.136	0.000b
Residual	13.742	37	0.371		
Total	43.655	41			

Table 3: Linear Regression Analysis for Design for Environment as Drivers That Influenced Supply Chain Decisions: Positively Related

Model 1	Sum of squares	df	Mean square	F	Sig.
Regression	24.253	4	6.063	15.438	0.000b
Residual	14.532	37	0.393		
Total	38.785	41			

Table 4: Linear Regression Analysis for Reverse Logistics as Drivers That Influenced Supply Chain Decisions: Positively Related

Model 1	Sum of squares	df	Mean square	F	Sig.
Regression	17.725	4	4.431	5.899	0.001b
Residual	27.791	37	0.751		
Total	45.516	41			

DISCUSSION

In this study, most respondents are aged more than 40 years old and followed by aged between 31 years old and 40-year-old. These results show that most supply chain professionals in Saudi Arabia are over 30 years old. Meanwhile, 45% of respondents had declared that their company revenue is above than 3,000,000SR.

Most respondents are strongly agreed if the firm tried to reduce or avoid the threat of current or future government's environmental legislation. Furthermore, most respondents resulted in an agreeable who answered strongly agree to slightly agree on government inspections or audits frequency toward their firm to ensure the firm is following environmental laws and regulation. The foundation and mandate regarding government legal position and interest in filing a civil lawsuit for environmental interests are very important [13]. The purpose is to restore environmental quality that has been polluted or damaged. There are 36% of respondents slightly agreed on large number of environmental regulation or restriction imposed by the government on the firm's industry.

Türkay et al. [14] mentioned environmental policies need to consider in the decision-making framework to have greener supply chain [14]. Besides, nearly half of respondents slightly agreed that customer frequency that required the firm to adopt green supply chain initiatives and customers had expressed to have clear policy statement on the company commitment to protect the environment.

The customer role is also important to the success of GSCM. Most customers want the firm to adopt green supply chain initiatives with nearly half of respondents slightly agreed on this statement. Meanwhile, nearly half of respondent also slightly agreed that need a clear policy statement regard their commitment to the environment. Besides, the customer also supports the firm to adopt green supply initiatives in the operation and management.

The firm also needs to have their responsibility and commitment toward environment. Most respondents strongly agreed that green supply chain initiatives are right thing to do for promoting societal welfare. Besides, the society health and safety also major concern in the firm. Most respondents strongly agreed that need to concern on society health and safety. Environmental pollution and food safety are most important can threat to human health [15].

GSCM is response to the growing awareness in global environmental which GSCM has merged as a concept that considers sustainability elements and combination of environmental thinking along the intra- and inter- firm management of the upstream and downstream supply chain [16]. Eltayeb et al. [17] found green supply chain initiatives had positive impact on the environmental outcomes, economic outcomes, cost reductions and intangible outcomes [17]. Most respondents agreed that green supply chain initiatives are generally considered in the industry due to marketing and operational benefits. Besides, green supply chain initiatives are also important in organizational image improvement.

The supplier also needs EMS certification for their operation such as ISO 14001. ISO 14001 promotes internal assessment in the consumption of energy and resources, the implementation of cost analysis in life cycle and other advance practices of environmental management that related in decreasing environmental impact [18]. Green supply chain role also impacts the product packaging. Most respondents slightly agreed on packaging had recyclable contents and reusable packaging. Meanwhile, most respondents agreed on the green supply chain's role in reduce the energy consumption.

The statistics analysis shows that green purchasing had significant positive impact toward supply chain decisions, $p=0.000<0.05$. Environmentally responsible purchasing is important since unplanned purchasing of goods can cause severe damage to the environment [19]. In additions, design for environment also had positive influenced in supply chain decisions. The design for environment considers environmental performance improvement in the procurement process [20]. Design for environment include design for resource conservation, using recycled materials in the product, designing product for reduce energy consumption. There are significant positive influenced between reverse logistics and supply chain decisions. Reverse logistics is referring to process of moving goods from their typical final destination from recapturing value purpose or proper disposal [21]. The reverse logistics implementation saves resources to certain extent, reduce business spending and improve their own unqualified product to control and improve business management system [22]. Reverse logistics is different than green logistics and some activities can apply both reverse logistics and green logistics that involved recycling, remanufacturing, reusable packaging, waste management, disassembly and design [23].

CONCLUSION

GSCM is a response to the growing global environmental awareness. GSCM has merged it into a concept that considers the integration of sustainability factors and environmental thinking in the management of the company's internal and inter-company, and upstream and downstream supply chains. In conclusions, GSCM had implemented in this study and factors such as regulatory pressures, pressures from customers, pressures from competitors, social and cultural responsibilities, green purchasing, environment driven design and reverse logistics. The results obtained show that the role of the customer and the responsibility and commitment of the firms are critical to the success of GSCM.

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