IMPLEMENTATION FRAMEWORK OF GREEN SUPPLY CHAIN MANAGEMENT IN MALAYSIA CONSTRUCTION INDUSTRY

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IMPLEMENTATION FRAMEWORK OF GREEN SUPPLY CHAIN MANAGEMENT IN MALAYSIA CONSTRUCTION INDUSTRY

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LIST OF ABBREVIATIONS

APM	Agile Project Management
BSEEP	Building Sector Energy Efficiency Project
CIDB	Construction Industry Development Board
CIOB	Chartered Institute of Building
CONQUAS	Construction Quality Assessment System
DOE	Department of Environmental
DOSH	Department of Safety and Health
EIA	Environmental Impact Assessment
EMS	Environmental Management System
IBS	Industrialized Building System
IPMA	Importance-Performance Map Analysis
ISO	International Organization for Standardization
MyCrest	Malaysian Carbon Reduction and Environmental Sustainability Tool
NGO	Non-Government Organizations
PLS-SEM	Partial Least Square-Structural Equation Modelling
QLASSIC	Quality Assessment System in Construction
REHDA	Real Estate & Housing Developers' Association
SMEs	small and medium enterprises
SRMR	Standardized Root Mean Square Residual
USM	Universiti Sains Malaysia
VIF	Variance Inflation Factor

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KERANGKA PELAKSANAAN PENGURUSAN RANTAIAN BEKALAN MESRA ALAM DALAM INDUSTRI PEMBINAAN DI MALAYSIA

ABSTRAK

Sektor pembinaan telah menyumbang dalam perkembangan ekonomi Malaysia tetapi pembangunan yang pantas turut mengakibatkan isu-isu alam sekitar yang menganggu kehidupan rakyat. Oleh itu, Pengurusan Rantaian Bekalan Mesra Alam (GSCM) telah diperkenalkan kepada industri pembinaan dalam satu dekad yang lalu kerana praktis ini telah mendapat reputasi yang baik dalam aspek peningkatan prestasi korporat hijau. Namun sedemikian, GSCM tidak asimilasi ke dalam kebanyakan aktiviti pembinaan. Kajian ini bertujuan untuk mengenal pasti praktis GSCM utama yang boleh dilaksanakan dalam industri pembinaan supaya ia boleh meningkatkan prestasi korporat hijau pemaju-pemaju perumahan dengan ketara dan mengembangkan kerangka GSCM dalam industri pembinaan yang berasal daripada industri perkilangan. Kajian ini fokus kepada kawasan yang luas di dalam industri pembinaan Malaysia. Oleh itu, kaedah kuantitatif telah digunakan dalam kajian ini dengan 188 responden. Tambahan pula, penemuan dalam kajian ini telah mendedahkan lima praktik GSCM utama yang boleh meningkatkan prestasi korporat hijau dalam konteks persekitaran, ekonomi dan operasi. Selain itu, kesan penyederhanaan peranan dalaman dan luaran pihak berkepentingan dalam rantaian bekalan antara pelaksanaan GSCM dan prestasi korporat hijau boleh meningkatkan kesan praktik GSCM kepada prestasi korporat hijau. Kajian ini telah berjaya mengembangkan kerangka GSCM untuk industri pembinaan sebagai rujukan. Akhir sekali, implikasi praktikal masa depan dan kesimpulan telah disediakan untuk memberi idea kepada pembangunan perlaksanaan GSCM untuk pemaju-pemaju perumahan di dalam industri pembinaan Malaysia.

IMPLEMENTATION FRAMEWORK OF GREEN SUPPLY CHAIN MANAGEMENT IN MALAYSIA CONSTRUCTION INDUSTRY

ABSTRACT

Construction industry has contributed to the raise of Malaysia's economic but rapid development has caused environmental issues that severely impacted the daily life of citizens. Therefore, Green Supply Chain Management (GSCM) was introduced to the construction industry in the last decade as this practice has earned good reputation in improving green corporate performances. However, GSCM did not assimilate into majority of the construction activities. This study was intended to identify the main GSCM practices that can be successfully implemented in the construction industry which can improve green corporate performances of property developers significantly and to develop a GSCM framework in construction industry which learned from the manufacturing industry. Since this study was focusing on big area of Malaysia construction industry, a quantitative method was employed to carry out the research with 188 respondents. Moreover, the findings of study revealed that the five main GSCM practices can improve the green corporate performances in the context of environmental, economic and operational performances. Furthermore, the moderation effect of internal and external roles of stakeholders in the supply chain between GSCM implementation and green corporate performances can enhance the impact of GSCM practices on green corporate performances improvement. Therefore, this research has developed a GSCM framework for construction industry successfully as practitioners' reference. Lastly, future practical implications and conclusions were provided which shed light on GSCM implementation development for property developers in Malaysia construction industry.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Malaysia is developing rapidly in these two decades due to the government policies such as Vision 2020 that started in 1991 which focus on country development. This policy will be updated for every subsequent five years in order to ensure Malaysia achieves the status of the developed country in year 2020 (Khoo, 2016). The rapid development in Malaysia has brought plenty of job opportunities to the citizens and the outcomes of the development have brought a more convenient life to the people (Transformasi Nasional 50, 2017). This proved the plans carried out by the government is effective in developing Malaysia toward developed country.

Construction industry is one of the main contributors to the country's Gross Domestic Product and Gross National Product calculation. It is strongly believed that the bloom of construction industry will lead the economy of Malaysia to become better. Despite the benefits, construction industry is believed to be responsible for 33 percent of the global carbon emissions, 33 percent of global resource consumption, 40 percent of the world's energy consumption, 40 percent of generated global waste and 25 percent of the world's total water consumption (UNEP-SBCI, 2016). The world is expected to have 66 percent of population live in city by 2050 (Department of Economic and Social Affairs, 2014) which means there will be more greenhouse gases emissions such as CO_2 in the coming few decades (Levine et al., 2007). Hence, it is crucial to take immediate actions now such as practicing green and sustainable development to ensure future generations can keep surviving (UNEP, 2014).

Recently, there are signs on environmental issues which are the consequences of the rapid development that carried out without proper care and planning. Climate

change has become one of the most significant consequences that arises due to the rapid development done in Malaysia (Balasubramanian & Shukla, 2017). The climate change arises due to the rocketed amount of greenhouse gases that emitted during the progress of construction. As development is happening in haste, resources depletion has become one of the issues that encountered by current generations (UNEP, 2010).

Construction projects have to be completed in several stages which involving numerous parties before it can be completed in a given period of time frame (RIBA, 2013). During the construction period, there are thousands of activities which involving the manufacturing of raw materials into end products, transportation of materials and assembly of delivered materials. If these activities are not planned and carried out properly, wastage of materials and unnecessary amount of greenhouse gases will be emitted to the air and caused environmental problems such as air pollution and climate change to the environment (Khoo, 2016).

There are efforts done by several relevant parties which including the researchers from the academia and professionals from the industry to help in the mitigation of the consequences brought by the rapid development (Dubey, Gunasekaran, & Papadopoulos, 2017). However, most of the efforts are unsuccessful due to the individual stakeholder only focus on their point of view which will drive to the lack of holistic understanding which might cause the policy makers such as government agencies to wrongly address the issues and neglecting the aspects that have more significant impacts toward the environment (Balasubramanian & Shukla, 2017). On the other hand, property developers (Abidin, 2010) and the contractors (Qi, Shen, Zeng, & Jorge, 2010) covering only a small portion of supply chain issues in isolation where the issues are green transportation (BRE, 2003), green purchasing (Varnäs,

Balfors, & Faith-Ell, 2009) or management issues such as “drivers” of green practices (Qi et al., 2010) and “barriers” to green purchasing (Sourani & Sohail, 2011).

The involvement of government is needed to change this trend as implementation of government regulations has the power of enforcement to all parties in the construction industry (Rajesh & Shiena, 2015). The implementation of government regulations has the legislation power that impose external pressures on corporates in construction industry to implement green and sustainable approaches (Balasubramanian & Shukla, 2017). With the coercive pressures and encouragement from public and private sector, most of the firms will consider green practices in their current daily routine and future projects.

There are many approaches such as Green Building Index (GBI) (Nagy et al., 2014; Sim & Putuhena, 2015; Tsai, Yang, Chang, & Lee, 2014), Lean Construction (Eriksson, 2015; Sertyesilisik, 2016; Yin, Tserng, Toong, & Ngo, 2014), Agile Project Management (APM) (Anoop, Atul, & Nitin, 2016; Matawale, Datta, & Mahapatra, 2016), International Organization for Standardization (ISO) (Hsu, Choon Tan, Zailani, & Jayaraman, 2013; Miroshnychenko, Barontini, & Testa, 2017; Zhao, Zhao, Davidson, & Zuo, 2012) and Leadership in Energy and Environmental Design (LEED) (Li et al., 2013; Mollaoglu, Chergia, Ergen, & Syal, 2016; Syal, Mago, Abdulrahman, Li, & Mago, 2011) that can be practiced in construction industry to mitigate the consequences of rapid development without compromising the current development’s effort to achieve developed country in future. One of the approaches is Green Supply Chain Management (GSCM) that have been long practiced in other sectors such as manufacturing industry (Dubey et al., 2017). GSCM consists of several green practices in a complete supply chain which starts from green design, green purchasing, green transportation, green construction and ends on reverse logistic (Balasubramanian &

Shukla, 2017; Runala & Zaffar, 2015). These five main practices in GSCM will bring a lot of improvement in reducing wastage, pollution and damages to the environment if it is practiced neatly.

From the statement above, practicing GSCM has several attractive benefits to the practitioners where the awards of practicing these practices can meet the organization main goals and objectives. Practitioners can enjoy the reward in the aspects of environmental, economic, operational and social performances where the conventional practice does not own. This clearly shows that GSCM is the trend of the future in construction industry that should be considered by property developers (Rao, 2002).

1.2 Research Background

Malaysia is one of the rapid developing countries in South East Asia and this country has a population of over 32 million in 2019 (Department of Statistics Malaysia, 2019a) where the density is about 10 people per square kilometre (3 258 140 people / 330 803 square kilometre). With this density, Malaysia is the 44th most populous country in the world. Furthermore, Malaysia has good economic records in Asia since 1957 with the growing Gross Domestic Product of an average of 6.50% annually for almost 50 years. Due to the economic records and population, a lot of mega construction projects have been done in Malaysia such as Kuala Lumpur City Centre (KLCC) and Kuala Lumpur Tower (KL Tower) which have used up thousand tonnages of cement that consumed devastating amount of energy. From the data that given by the Department of Statistics Malaysia (2019a) and the economic records of Malaysia, it is believed that there are still plenty of potential developments that can be made in Malaysia due to its assets and wealth in the country.

According to Transformasi Nasional 50 in year 2017 that announced by the federal government, there are many development plans that introduced by Malaysia to develop the country in order to have first class facilities in the world. Besides that, federal government will impose lower tax to the foreign firms that set their factories or offices in Malaysia in order to attract more interested parties to set their bases in Malaysia (Transformasi Nasional 50, 2017). As the results, there will be more mega construction plans that attracted to be built in Malaysia in the next 30 years such as Forest City in Kota Iskandar, Johor and Bandar Malaysia in Kuala Lumpur which will need more environmental friendly and green approaches to be implemented in the construction industry to sustain the environment in Malaysia. These long term construction plans will direct and indirectly improve the nation's economy where more work opportunities are provided with better facilities to the citizens (Khan et al., 2014).

Malaysian government is trying to become developed country in 2050, but environmental protection will not be compromised by the government. Malaysia as a developing country has introduced several green concepts into construction industry such as Building Sector Energy Efficiency Project (BSEEP) and Malaysian Carbon Reduction and Environmental Sustainability Tool (MyCrest) (CIDB, 2017) to monitor the construction activities that are flourishing in Malaysia and lessen their negative impacts. Among the green practices that introduced by the government, a systematic green practice should be picked and implemented in the construction industry.

Furthermore, as the developments have cause serious deforestation in the states, several states' government have tried to mitigate the environmental impacts due to the vigorous construction that mostly come from the deforestation activities (Briffett, Obbard, & Mackee, 2012). Furthermore, Malaysia federal government also has formed several departments such as Department of Environment (DOE) and Construction

Industry Development Board (CIDB) to monitor and guide the construction activities who will take adequate actions to reduce the percentage of pollutions (Oon & Helen, 2008). This shows that Malaysia federal and state governments are putting effort by cooperating in handling environmental issues without sacrificing both development and natural of the country.

There are various main stakeholders in construction industry which consist of client, property developers, consultants, contractors and suppliers who are collaborating in order to complete a concept or idea of client into physical building (Balasubramanian & Shukla, 2017; RIBA, 2013). Among these stakeholders, property developer is the stakeholder that plays the crucial rule on the practices at construction site during the construction project period (Abidin, 2010; Balasubramanian & Shukla, 2017; Basu, Karmakar, & Bhattacharya, 2015; Saleh & Al-Swidi, 2019; Wibowo, Handayani, & Mustikasari, 2018). This is because property developer initiates a project with the requirement of creating green supply chains and implementing GSCM in the construction project where the rest of the downstream supply chain stakeholders will have to implement the requirements in the context of green behaviour in construction activities who have been awarded the project tender.

Balasubramanian and Shukla (2017) in their research have said that appointed downstream stakeholders such as sub-contractors and suppliers will need to deal with the rest of the upstream stakeholders to ensure the project stay green in the whole construction period. Therefore, property developers are chosen as the research target in this study to ensure that the target respondents can control and implement GSCM within the construction projects.

To sum up, GSCM is one of the most appropriate solutions to reduce the terrifying consequences that due to the active construction activities (Harty, 2008).

Some of the parties in the construction industry such as contractors and subcontractors have tried to participate in the GSCM (Tennant, 2014) but they are just a small number compared to the whole industry. This situation can still be improved by increasing the awareness of the whole construction industry (Balasubramanian & Shukla, 2017) through several steps such as incentives, education (Lai et al., 2011), government policies (Lee, 2008) and regulations (Lin & Ho, 2011). Lastly, the relationship between the private sector and government towards the encouragement of implementing GSCM in the construction industry is believed to be positive (Zhu, Sarkis, & Lai, 2013b).

1.3 Problem Statement

Malaysia aims to achieve the status of top 20 developed countries in year 2050 where rapid development is expected to be happening in the next three decades (Transformasi Nasional 50, 2017). In this process, urbanization will slowly take over the rural areas with infrastructures, housing and commercial development. Study has shown that about 66 percent of the population is expected to stay in the urban areas in 2050 (Department of Economic and Social Affairs, 2014). To ensure every citizen live in convenient and high living standard city, Malaysia has planned to construct several mega projects such as Mass Rapid Transit project, MyHigh Speed Rail and East Coast Rail Link which means there will be more large projects in the future (Transformasi Nasional 50, 2017).

Therefore, to ensure the growth of the economic and urban in Malaysia will not affect the environmental which caused by the active development activities, GSCM should be implemented in the construction line as there are many researches that have been done previously. The results shown that implementing GSCM will improve practitioners' corporate overall performances (Malviya & Kant, 2015), especially in

those mega projects that costed billions of Ringgit Malaysia (Balasubramanian & Shukla, 2017). However, currently there are no research that study on the GSCM framework where the multiple supply chains stages in the GSCM approach implementation which including the internal and external stakeholders' involvement that affect the overall corporate performances are studied. To ease the understanding, there are several issues shows in Table 1.1 that needed to be answered before the implementation of GSCM in construction industry can be improved and successfully implemented.

Table 1.1 Current issues in construction industry

Current issues	Sources
The GSCM practices that can be practiced in construction industry	(Badi & Murtagh, 2019)
The factors that will motivate the stakeholders to implement GSCM	(Muduli, Govindan, Barve, Kannan, & Geng, 2013; Nathália, David, & Silvio, 2017)
Roles of stakeholders in GSCM practices implementation	(Badi & Murtagh, 2019; Wyawahare & Udawatta, 2017)
GSCM impact on the overall firm's performances	(Badi & Murtagh, 2019; Balasubramanian & Shukla, 2017)

Furthermore, as the roles and scopes of the stakeholders in GSCM practices implementation are unclear, there are more spaces and potentials for researchers to make improvement by providing a more comprehensive guidance to the practitioners as the construction industry is complex (Badi & Murtagh, 2019). This industry has various stages, levels and different parties in a single construction project which will cause the overlapping of works, unclear communications and errors in the received instructions by the executioners. These problems can be mitigated and solved if a framework which can show a proper scope and guidance to all related stakeholders in the construction project to lead these people to work on the path planned at the early stage of construction works. The GSCM practices' framework has been proven to

work in other industries and countries which will bring significant improvement to environmental and economic performances, thus, a GSCM framework should be introduced into Malaysia's construction industry (Balasubramanian & Shukla, 2017).

As the performance of the GSCM depends not only on green practices and roles of stakeholders, it becomes necessary to establish a comprehensive GSCM framework to guide the practitioners (Martínez-Olvera & Shunk, 2006). A comprehensive framework refers to a list of constructs that help to understand the field and thereby identify the main elements such as barriers and drivers which related to such practices (Assumpção, Campos, Jabbour, Jabbour, & Vazquez-Brust, 2019). On the other hand, comprehensive frameworks also tend to assume that the hypotheses are equally relevant to all types of GSCM practices. Therefore, a comprehensive framework is used in this research to show all the related elements in GSCM practices and green corporate performances.

There are demands to implement GSCM in construction industry in order to improve the practitioners' corporate performances but there is no research in Malaysia's construction sector that evaluate the relationship between GSCM and corporate performances (Balasubramanian & Shukla, 2017). The construction industry is huge and there are many parties involved in a particular construction project that will make large positive impact towards the sustainability and greenability of the project if all parties involved are practicing GSCM effectively (Rezgui, 2009).

Construction industry is a combination of hundreds different stakeholders who are playing different roles in the construction process (Balasubramanian & Shukla, 2017; RIBA, 2013). Since this industry has many stakeholders, the supply chain must be very complicated to be understood and controlled if no comprehensive framework is provided. Currently, there is no clear framework for the implementation of GSCM in

construction industry which can aid the stakeholders to understand their roles and work of scopes (Wyawahare & Udawatta, 2017). Hence, providing a comprehensive framework for stakeholders is essential in encouraging them to start implementing GSCM.

However, due to the quantity of total parties involved in construction industry is too large, it is suggested that the influence of internal (Balasubramanian & Shukla, 2017; Yu & Ramanathan, 2015) and external (Badi & Murtagh, 2019; Zhao, Liu, Zhang, & Huang, 2017) stakeholders on the corporate performances after practicing GSCM are investigated. The bulk quantity of firms in construction industry also allows the researchers to investigate the influence of triple bottom line and operational performances towards the encouragement of firms to participate in GSCM practices (Balasubramanian & Shukla, 2017; Khoo, Radzi, Ha, Mohd Wira, & Tee, 2019a; Li, Xu, Sun, & Ding, 2019; Rohani, Marini, & Ramayah, 2019). The triple bottom line and operational performances are evaluation methods that will evaluate the impact of implementing GSCM in the aspects of economic, environmental, operational and social which are the factors to measure the corporate performances (Famiyeh, Kwarteng, Asante-Darko, & Dadzie, 2018; Gimenez, Sierra, & Rodon, 2012; Masa'deh et al., 2017; Yu, Chavez, Feng, & Wiengarten, 2014).

There are several research gaps which were found in other researches and journal papers that can be further researched. These research gaps are the roles of key internal and external stakeholders, motivators for key stakeholders, comprehensive framework of GSCM to the practitioners, the impacts of GSCM practices toward the green corporate performance in the construction industry.

1.4 Research Questions

i. What are the current green practices in GSCM that are currently practiced by Malaysia' property developers?

ii. What are the impacts of GSCM implementation towards green corporate performances in Malaysia property developer' firms?

iii. How do internal and external stakeholders' roles affect green corporate performances in Malaysia property developer' firms?

iv. Does green supply chain management have a framework to guide practitioners?

1.5 Research Objectives

i. To identify the green practices in green supply chain management that affect Malaysia construction industry.

ii. To examine the impact of green supply chain management implementation to green corporate performances.

iii. To examine the impact of internal and external stakeholders' roles as moderators to green corporate performances.

iv. To propose a framework of green supply chain management in construction industry.

1.6 Research Scope

This research aims to identify the current GSCM practices that are practiced by Malaysian property developers and to create a new framework of GSCM practices implementation as property developers' guidance. This framework will show the impact of GSCM practices toward green corporate performances and the roles of

internal and external stakeholders that should be taken into consideration during the implementation of GSCM practices.

According to Zailani, Ariffin, Iranmanesh, Moeinzadeh, and Iranmanesh (2016) and Bhool and Narwal (2013) studies, Malaysia is one the countries that has started practicing GSCM in South East Asia since 2000s. This is because GSCM is a concept that gives benefits to the practitioners in the return of several aspects such as higher quality, better services, reduce wastages, aim for no pollution, good reputation and intensive earning on investment in this green initiatives (Dubey et al., 2017). Moreover, the implementation of GSCM not only maintain the practitioners' current corporate performances but somehow it might improve the overall performances of the firms (Gimenez et al., 2012; Sharma, Chandna, & Bhardwaj, 2017). Therefore, it is appropriate to conduct a research that related to GSCM practices in Malaysia construction industry.

Since this approach is giving many benefits to the practitioners, it has been practiced in manufacturing industry over the last decade to ensure that they are able to compete with others in this global market (Rajesh & Shiena, 2015). Therefore, GSCM practices should be introduced into the construction industry in Malaysia. Furthermore, Balasubramanian and Shukla (2017) said that construction projects are involving numerous of parties which including property developers, consultants, contractors, subcontractors, suppliers, government and house buyers which need to be taken into the consideration during the construction projects to improve efficiency.

Currently, Balasubramanian and Shukla (2017) said that construction industry is lacking of knowledge and awareness in implementing GSCM in their projects, especially in mega projects that involving thousands of parties which including property developer, consultants, contractors, subcontractors and suppliers. This

formed a huge barrier to the firms to start implementing GSCM (Luthra, Kumar, Kumar, & Haleem, 2011).

As the effort to promote GSCM into the construction industry should begin with those powerful and influencing stakeholders such as property developers (Balasubramanian & Shukla, 2017; Zhang, Shen, & Wu, 2011), thus, property developer should actively participate in GSCM practices. This is because by practicing GSCM, they not only obtain benefits in terms on environment but also on economic, operational and social where it is clearly shown in triple bottom line concept and operational performances (Famiyeh et al., 2018; Gimenez et al., 2012). The roles of internal and external parties will be considered in this study as their impacts on green corporate performances are significant in other researches (Balasubramanian & Shukla, 2017). Construction industry tends to ignore this green approach as they are not aware of its benefits and has less knowledge about it (Zhang et al., 2011). The scope of this research is to figure out the green practices in GSCM that can be practiced in construction industry and improve the green corporate performances of property developers where the details and particular of research flow is shown as

Figure 1.

1.7 Significance of Study

By conducting this research, the importance of implementing GSCM can be shown to construction industry. There are several steps to promote the GSCM practices to

construction industry, the most significant way is by introducing the benefits of GSCM which taking care of the economic, environment, operational and social performances of the property developers. Hence, identifying the impacts of GSCM implementation and roles of stakeholders onto corporate performances are essential in the effort to provide a framework which can lead the stakeholders to the green initiative adoption. By completing this research which can perfectly answer the research gaps will help practitioners to implement GSCM successfully and further encourage those who are still considering the GSCM adoption. Several research gaps are found in other researches and journal papers regarding the implementation of GSCM in construction industry that can be researched further are listed below:

i. identifying GSCM practices that can be practiced in construction industry (Balasubramanian & Shukla, 2017).
ii. to examine the impacts of GSCM implementation toward corporate performances (Famiyeh et al., 2018; Masa'deh et al., 2017).
iii. to examine the impacts of internal and external stakeholders toward corporate performances (Badi & Murtagh, 2019; Yu & Ramanathan, 2015).
iv. to propose a comprehensive framework for GSCM practitioners (Balasubramanian & Shukla, 2017).

Furthermore, Yu et al. (2014) have mentioned that proposing a comprehensive framework to lead the GSCM practitioners will help them to uncover the critical area in GSCM implementation processes where many other researchers are not able to explore these areas in previous studies. There are various kind of conceptual frameworks for GSCM which have been introduced in other sectors (Balasubramanian & Shukla, 2017; Carter & Rogers, 2008) but very less in construction industry which caused no consensus framework to guide the stakeholders. A new comprehensive and

appropriate framework to guide the practitioners in GSCM will be proposed to the local construction industry stakeholders from this study.

1.8 Research Method

In this research study, various research methodologies will be used on different objective and type of data collected to ensure the most appropriate method is used to obtain the most accurate results that can show the reality of Malaysia construction industry. Secondary data will be obtained from literature review to have a basic and preliminary concept before commencing the survey that intended to verify the accuracy of the data sets collected. This will increase the confidence in publishing the results to the world due to the precision in the results given.

Firstly, this study will use a systematic literature review where abstracts from books, journal papers and articles will be used to identify the green practices in GSCM, GSCM implementation and roles of stakeholders that affect the green corporate performances. Green corporate performances are consisting environmental, economic, operational and social performances (Younis, Sundarakani, & Vel, 2016). Okoli and Schabram (2010) mentioned that the literature review must be done on high reliable sources to assure the accuracy of the results. Therefore, the literature review will mainly focus on those high reliable sources such as journal papers from Emerald Insight, Science Direct, Web of Science and ProQuest databases. All related articles will be read and filtered to obtained the most accurate and relevant secondary data from these sources (Xiao & Watson, 2017).

Next, quantitative research methodology will be carried out where a structured questionnaire will be created based on the previous systematic literature review to confirm the reliability of the collected data from journal papers and articles that

obtained from these sources (Michel. et al., 2011). The questionnaire will be used to collect data about the implementation of GSCM and green corporate performances among property developers in Malaysia. The collected data will be analysed by using IBM SPSS Statistics 25 and SmartPLS 3 computer software. Descriptive analysis will be used to analyse the background of respondents in order to understand the details of the involved property developers in Malaysia.

To ensure the results from this research is reliable and countable to be used as references for other future researches, Partial Least Squares – Structural Equation Modelling (PLS-SEM) analysis method will be employed to examine the relationships between independent and dependent constructs (Hair, Hult, Ringle, & Sarstedt, 2017a; Hair, Sarstedt, Ringle, & Gudergan, 2017b). Several tests on the data reliability such as Variance Inflation Factor (VIF), outer weights and T-statistics will be carried out and reported. After the tests have been done, T-statistics between independent and dependent constructs will be calculated by SmartPLS 3 to find out the negative and positive value in the relationships of these factors towards green corporate performances.

Lastly, a new comprehensive framework will be shown based on the survey results calculated by the software to help the practitioners to understand thoroughly on GSCM implementation in the construction industry. The aid of PLS-SEM computer software, SmartPLS 3 will be maximized to sketch the appearance of comprehensive framework of GSCM to guide the GSCM practitioners (Hair et al., 2017a; Hair et al., 2017b).

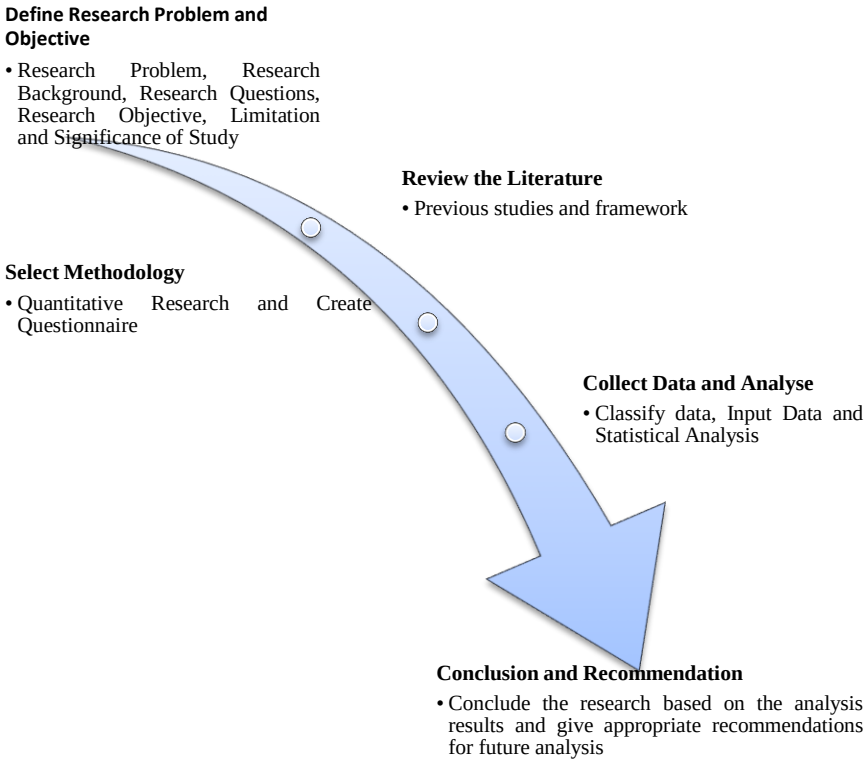

Figure 1 Research Flowchart

1.9 Thesis Outline

This thesis consists six chapters where the summary of each chapter is shown below.

Chapter One: Introduction of this research is written in this chapter where the background of research, problem statements, research objectives, research questions, research scope, significance of study and research methodology are stated.

Chapter Two: The literature of GSCM practices, roles of stakeholders and the green corporate performances are revealed in this chapter. The impact of GSCM practices which including green design, green purchasing, green transportation, green

construction and reverse logistics toward green corporate performances such as environmental, economic, operational and social performances are explained. The impact of internal and external stakeholders' roles such as top management, stakeholders in the supply chain, government and house buyers are discussed in this chapter too.

Chapter Three: Research design, data collection method, respondents, pilot study, the reliability and validity of data and method of analytical analysis which is the PLS-SEM analysis method is discussed in this chapter.

Chapter Four: The collected data from distributed questionnaires are analysed in this chapter where the data collected through quantitative research method are used for various analysis such as descriptive analysis and PLS-SEM analysis method.

Chapter Five: The findings of this research study on the impacts of GSCM practices implementation toward green corporate performances with the moderation effects of roles of stakeholders are revealed and discussed in this chapter.

Chapter Six: This thesis is finalised in this chapter where the conclusions and limitations are given. Recommendations for future research directions are provided as well. The contributions of this study toward academic and industry are discussed.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter explores the current GSCM practices that are practiced by property developers in Malaysia construction industry and their impacts on the green corporate performances. Moreover, the roles of internal and external stakeholders are also discussed in this chapter. This chapter explains about the development of GSCM practices since 2010s in Malaysia and other countries' construction industry towards the effort of achieving green development in construction projects.

2.2 Green Supply Chain Management (GSCM)

GSCM has various definitions that have been defined by other authors in other research papers where most of the definitions are defining GSCM as a supply chain management concept that integrates environment factor into the conventional supply chain method which commerce from the beginning until the end of the supply chain (Dubey et al., 2017). Schrettle et al. (2014) has defined GSCM as a mechanism to reposition a firm existing strategy into a better strategy which will improve the practitioners' corporate performances. From the definitions that collected through various authors, GSCM can be understood as a supply chain network that considering the environmental and financial dimensions while providing the products to the end users from the initial of raw materials, processing, delivering, consumption of end users and delivering the used products back to the factory for reprocessing process (Gunasekaran & Spalanzani, 2012; Khoo, Radzi, Mohd Wira, Mohamad Nizam, & Salman Riazi, 2019b).

To be more details, the operational definition of GSCM should focus on the core green practices such as green design, green purchasing, green transportation, green construction and reverse logistic. Core green practices should be evaluated since the beginning of the supply chain starts with green design as initial stage until the end of supply chain which ends with reverse logistic after completion stage. In construction industry, there are a huge number of complex procedures needed in order to complete a single project which consist of single or multi storey buildings (Rezgui, 2009), to utilise the resources, intensive knowledge of GSCM practices should be equipped (Razak & Ibrahim, 2020). In this case, green corporate performances are focused where strategy with supply chain design which focusing on environmental performances, economic performances, operational performances and social performances is the most suitable strategy. Hence, the implementation of GSCM is essentially important to ensure the green corporate performances can be achieved effectively.

Therefore, with the practice of GSCM in a project, it means improving the sustainability and corporate performances (Green, Zelbst, Meacham, & Bhadauria, 2012). GSCM can be understood as an evolution of conventional supply chain management which is due to the depletion of natural resources (Lu, 2007) and environmental problems (Srivastava, 2007). As the level of pollution in the world has started to threatening the world population and GSCM is one of the useful methods that can be carried out to mitigate the consequences of the rapid development caused by construction industry (Dubey et al., 2017).

2.2.1 Definition of Key Terms

Supply chain is a network of firms who are involving as upstream or downstream stakeholders in different processes and events that create value in the form of physical products or services to the house buyers (Dubey et al., 2017).

Green supply chain means integrating environmental concern into the traditional supply chain management without compromising the economic, operational and social performances of the corporate. This can be done by including the concern of green corporate performances in the events from the beginning until the end of the production line such as product design, materials selection and purchasing, transportation of the materials, construction process and as well as the end of life management of the building after its useful lifespan (Balasubramanian & Shukla, 2017).

Green Practices focus on the construction players' effort to cooperate with stakeholders and suppliers for the purpose of developing green products and outcomes that are environmentally friendly and sustainable (Zhu et al., 2013a).

Green supply chain management practices are a set of efforts or actions taken by a corporate who aim to improve their corporate performances in minimizing negative environmental impacts, maximizing profits, utilizing the operational capability of the corporate and enhance the reputation of their corporate in the market in a life cycle of a product. The practices start from the design of the product, purchasing of raw materials, construction of materials and lastly, the final disposal of the product (Huang, Tan, & Ding, 2015).

Green Design requires consultants such as architect, engineer and quantity surveyor to produce design of building that minimize the consumption of materials and energy, facilitate the reuse, recycling and recovery of component materials and parts

and avoid or reduce the use of hazardous products in the process of construction and operation of the building (Balasubramanian & Shukla, 2017).

Green Purchasing is a purchasing practice that ensured the purchased products or materials meets environmental objectives set by the purchasing firm, such as reducing the sources of waste, promoting recycling, reuse and reduction on the resources use (Friso & Kai, 2014).

Green Transportation refers to environmentally conscious transportation of products or services from suppliers to buyers with the purpose of having the least possible negative environmental impact (Green et al., 2012).

Green Construction refers to the use of environmental practices on construction site to minimize the environmental impacts of construction to the surroundings. These practices could include waste management planning, automation on construction, the adoption of prefabrication building elements and the use of energy efficient and low hazardous materials (Balasubramanian & Shukla, 2017).

Reverse Logistics refer to the process of recovering and recapturing the value of end of life products and unproductive assets through effective reuse and surplus sales. It requires the sale of excess inventories, scrap and used materials and excess equipment at construction sites (Laosirihongthong, Adebanjo, & Tan, 2013).

Environmental Performances relate to the property developer's ability to reduce energy usage, materials consumption, green gases emission, effluent wastes and to decrease the consumption of hazardous substances and toxic materials in construction projects (Zhu, 2016).

Economic Performances relate to the property developer's ability to reduce the costs associated with the energy consumption, purchased materials, waste treatment,

and fines due to environmental accidents during the construction process (Balasubramanian & Shukla, 2017).

Operational Performances relate to the dimensions where property developers decided to compete with the competitors. These performances can be evaluated through the capability of the whole organization where the staff can utilize the given resources in the organization in order to obtain all potential return as possible (Famiyeh et al., 2018; Yu et al., 2014)

Social Performances relate to the property developer's ability to improve their corporate reputation which will improve their sales. Furthermore, these performances also refer to the effort to improve staff's health and safety, provide safe and adequate working conditions and reduce the negative impacts of construction activities to the adjacent environment and residents (Balasubramanian & Shukla, 2017).

2.3 Evolution of Green Supply Chain Management in Industry

Initially the supply chain system was introduced to the industry in the early 1980s to reduce the cost while improving their services without or with very little concern on the environmental dimensions (Dubey et al., 2017). However, the environmental issue has become severe over the time and the consequence has acted as pressures such as coercive pressure, normative pressure and mimetic pressure which have driven the conventional supply chain to be evolved and redesigned in order to include the environmental dimensions which can mitigate the environmental issues (Gunasekaran & Spalanzani, 2012).

In the last decade, the initial form of green supply chain has been formed and the concept of this supply chain is based on a close loop supply chain which means there are possibilities in obtaining profit from the action of reusing products, recycling of

products and use of the used products as value added components (Soleimani et al., 2014). Based on Nelson et al. (2013) research, countries such as United Stated America has started to rise in environmental awareness in the 1960s and the awareness level on environmental has slowly arise around the world but mega manufacturing countries such as China and India are still late in responding to the environmental issues. Luckily, now most of the firms in China and India have started to integrated environmental dimensions in their organization operation (Dubey et al., 2017; Zhu et al., 2013a).

Dubey et al. (2017) highlighted that the early GSCM was only focused on a single objective which is the environmental performances as their main priority. This has changed in recent years as many firms who implementing GSCM realized that focusing on a single objective solely will not bring sustainability and cannot be called as green initiative. Therefore, many firms have started to listen to the opinions and suggestions from the academic experts where they are suggested to adopt more comprehensive performance frameworks such as the triple bottom line which are the environmental performances, economic performances and social performances (Gimenez et al., 2012). Furthermore, Younis et al. (2016) said that operational performances should be taken into the consideration as well because the quality and lead time in the construction project is essentially important. Giovanni (2012), Hollos et al. (2012) and Balasubramanian and Shukla (2017) have expressed the same opinion on this matter, the sustainable and GSCM have been completely evolved from conventional supply chain into GSCM in recent years. Supply chain practice has been slowly evolved in the past two decades due to several types of external pressures arise from environmental issues and firms' interest. The evolution has reached the state of green concept where it is taken into the consideration where this concept has become the guiding philosophies for firms to operate today (Dubey et al., 2017).

Although GSCM practices have been evolving since the past two decades but there are still gaps for the improvement and development (Fahimnia, Sarkis, & Davarzani, 2015). These gaps are mostly due to the perspective of organizations on the supply chain management. Certain organizations only focusing on monitoring and collaborating with their stakeholders and suppliers but not cooperating or participating in the supply chain itself (Sini, Juuso, & Lauri, 2017). Thus, the gaps have created different competitive strategies among organizations in different operational context. However, researches which are covering both perspectives are still less in number and more efforts should be done in this aspect (Lee, 2015). This shows the possibilities for researches in this direction.

2.4 Theories Related to Green Supply Chain Management in Organizations

According to Koulikoff-Souviron and Harrison (2008), it is very normal that a new field of study will borrow existing theories from other similar fields to help in enhancing, enriching and broadening the new knowledge. Since GSCM has been claimed to generate competitive advantages to practitioners' organizations (Gardas & Narkhede, 2013), it is believed that there is theoretical link between the competitiveness advantages and corporate performances. However, Dubey et al. (2017) has claimed that currently there is no comprehensive framework to support the fact that GSCM is more advance than other supply chain system. Today, GSCM has slowly assimilated into the world, but it is hard for researchers to move the related researches to the next level without a strong supporting theoretical background.

There were efforts of researchers in the past in the early 2000s where Zsidisin and Siferd (2001) and Carter and Jenning (2002) have tried to develop the theory related to environmental practices such as proofing that environmental purchasing and their