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# EXPLORING THE RELATIONSHIPS OF GREEN HUMAN RESOURCES MANAGEMENT (GHRM) AND OUTCOMES OF GREEN SUPPLY CHAIN MANAGEMENT (GSCM): EMPIRICAL EVIDENCE FROM RESOURCE-ORIENTED COMPANIES IN NANNING, CHINA

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## Abstract

**Purpose -** The purpose of this research was to investigate the relationships between green human resources management (GHRM) and Green supply chain management (GSCM) and Companies' performances (CP). This aims primarily at enhancing companies' environmental and operational performances in resources-oriented industry of Nanning, China. In order to investigate this specific adoption of GSCM, the research model was conceptualized concerning the extant literature of GHRM and GSCM.

**Design/methodology/approach-**The questionnaire survey instrument was developed for archiving objectives of this research. The questionnaire was purposefully distributed to the companies that adopted GSCM practices in Nanning city of China, In total, 453 questionnaires were completed. EFA and CFA method were conducted to tested the validity and reliability of data and measurement models. SEM (Structural equation modeling) method was used to investigate and test hypotheses proposed in the research conceptual model.

**Findings -** The statistical results indicate the positive relationships between green human resources management (GHRM) and green supply chain management (GSCM) practices. The findings suggested that resources-oriented companies that adopted GSCM tend to help them improve both environmental and operational performances.

**Research limitation/Practical implications -**The results of this research are limited by the specific group of resources-oriented industry in Nanning city in China. Based on the findings resulted from this study, companies and regulators in Nanning city can understand more about GHRM and GSCM, which can help enhance the operational performances and environment performances of companies.

**Originality/value -** This paper suggested that resources-oriented company should implement green human resources management (GHRM) to enhance green supply chain management (GSCM) practices implementation. This can improve the environmental and operational performances of company. This paper therefore provides good approach for companies intended to adopt GHRM for eliminating pollution and improving operational performance. The originality of this research is to investigate the relationships of GHRM and GSCM using questionnaire survey gathered in resource-oriented companies in Nanning city in China.

**Keywords:** Green human resources management (GHRM), Green supply chain management (GSCM), Environmental performances, Operational performances, China resources-oriented company

# Introduction

Why we need green concept, because it can support companies and business sustain in the long run and prepare the resources for next generation. The traditional human resources management and tradition supply chain management are all required for green design in recent years, even more and more survey institution and scholars had proposed further study of both subject, and introduce the concept of green human resources management and green supply chain management, First time indicate by Renwick et al., (2013, 2008), but this kind of studies still insufficient, especially the combination of two subject and also the outcomes of the integration of green human resources management and green supply chain management, thus, study this two subject combination is good for operation and human management development. Jabbour, (2013) is the first scholar who point out that the necessary of this combination study, Because Green supply chain management can improve the environmental and operational performances of company, and the participant of green human resources management will also can enhance the GSCM implementation, thus, the combination of this two variables can let company gain a better results in performances, such as reduce the scrap rate and harmful materials or improve the capacity utilization in production process. Under this background, this research decide to find out the relationship between GHRM and GSCM and also the most important human resources practices for green supply chain management performances.

When the traditional human resources management consider about the adoption

of green practices design, it will become GHRM (green human resources management), the same, for GSCM (green supply chain management), it also require the general supply chain management link to the green development. The integration theory above are point out by Sarkis, (2012). The green notion, it means eliminate the negative effects on environment.

Even more and more scholars contribute to human resources management and supply chain practices, such as Lengnick-Hall et al., (2013), but the advances study of these two subject are totally separate, it means have few scholars link them together and explore the outcomes.

Resources-oriented enterprises are very special in NANNING, China. Their producing model is based on the exploitation and primary processing of natural resources, and the major competitive strength of them just comes from theirs monopolization of resources. Wang Fang, (2013). Obviously, the green supply-chain management of this kind of companies has some special characteristics which different from other kinds of companies in China. Due to the special features of Chinese Resources-oriented companies, so the absence of green supply-chain practice of this kinds of companies are more serious and importance. On the other hand, all of the supply chain design and implementation have to depend on the support of human resources, because employee can directly change the performances. Thus, when the green human resources can match the green supply chain management, companies outcomes will improve a lot. The research objective of this article aim at investigating the relationship between GHRM and GSCM performances of resources-oriented company.

Thus, the objectives of this study have 3 points, can list as follows: 1. What is the relationship between GHRM and GSCM in resources-oriented industry in Nanning, China? 2. How GSCM practices affect companies performances, it is positives or negatives or even irrelevant ? 3. what is the mediation effects among GHRM, GSCM and companies' performances ?

# Literature review and hypotheses

## Resources- oriented company in Nanning, China

Nanning is the capital city of Guangxi Zhuang Autonomous Region which locate in southern part of China, The host city of "ASEAN EXPO", Because of the conveniences of transportation, Nanning city is the policy, cultural, Financial and international trade center of Guangxi province, thus, ASEAN countries is the most important business partner for Nanning city, Analyzing the sustainability and environment protection in Nanning city is very significant. Nanning pollution level is high and air, drinking water pollution index are reach 75.00 even the green quality index is 83.33. The insufficient

of supply chain management study and regulation laws hinder the development of Nanning city. National Green Model City" (2015). The study about supply chain management is insufficient compare to other cities.

Ying, et al (2006) is defined as the resource-oriented enterprises such as steel produce companies, non-ferrous metals companies, building and architecture materials enterprises which rely on exploit natural mineral resources as basic materials enterprises; The theory of exploitation of resources Liu Fang (2012) illustrate that the underground resources exploitation and processing of monopoly is defined as the resource-oriented enterprises; Resource use intensity theory, Wang Fang, (2013), it pointed out that resource-oriented enterprises is wildly use the non-renewable natural resources as exploitation object, and resource use intensity percentage between 30% and 40% in the major products.

## Green human resources management (GHRM)

The key definition of "Green Human Resource Management" (GHRM) was reveal byJackson and Seo, (2010),the word "green" means pollution elimination; Renwick et al., (2013). Can summarize like: The human resources management (HRM) method which combine with green notion practice, and focus on the environmental performances of company. It means green human resources use early traditional human management method as fundamental stage and change the general aspect into environmental issues Jackson and Seo,(2010).Human resource management practices plays an important role in companies polluted control performances, it is also good for ecological situation sustain in the future and prepare sufficient development resources for the next generation. Jabbour and Santos, (2008); Jabbour et al., (2008); Daily et al., (2012); Daily and Huang, (2001); Kitazawa and Sarkis, (2000); Based on the analysis above, Daily and Huang (2001) emphasize that the green development cannot leave the design of human force management practice, Company can concentrate on the practices as below: (1) green skill workers recruitment (green recruitment), (2) appropriate selection for environmental protection implementation (green selection), (3)green and sustainable training program (green training), (4) green result feedback evaluation mechanism (green evaluation), (5) punishment and rewards for inner workers (green encouragements ).

## Green supply chain management (GSCM)

The word "green" means environmental protection and pollution elimination. In the perspectives of company, if they want to develop in the long run or even

demand for the situation of sustainability, companies have to concentrate on the entire supply chain system. Vachon et al. (2008). In the operation management scholar areas, the major and crucial purpose of sustainable supply chain management is trying to tradeoff these three bottom line: environmental protection, social relationship and profit maximizations. Beske, et al (2014); Pagell, et al (2014); Grimm, et al. (2014). The key definition of GSCM (green supply chain management) is a part of SSCM (sustainable supply chain management), Gunasekaran and Ngai, (2012), which can illustrate like: The supply chain management (SCM) system which focus on the high standard of enhancement in environmental protection or green sustainability notions. Kannan, (2014). Zhu et al. (2008) using quantitative research to prove the green supply chain management practices which conduct well in companies supply chain process. The specific practices structure can list below: (1) Internal environmental management, (2) Green purchasing, (3) Cooperation with consumers, (4) Eco-design, (5) Recovering investments, (6) Reverse logistics.

## GHRM and GSCM

The significant evidences of human resources management to supply chain management can be search in some scholars research. The detail show as bellow: (1) Supply chain management is the most important firms' practices for enhancing firms' differentiation advantages strategy in recent years, and human resources management contribution is necessary. Gunasekaran et al., (2008); (2) Human resources managers have methods (such as evaluating and rewarding) which are helpful for introducing a more systematically knowledge of the supply chain management notions in inner company situation.So for green practice also can link to human performances; (3) Leadership believes and human regulation rules have significant influences on the high quality conducts of that companies' supply chain practice. McAfee et al., (2012), (4) Human resources management have significant effects on supply chain practice, and the practice can be any forms. Martínez-Jurado et al., (2013); Based on this literature review, it means the green practices of supply chain management also affect by human resources management.(5)Human resource factors mitigate the adverse effects of implementation barriers on the success of SCM practices. Gowen III and Tallon, (2003); (6) Human resources management practices (such as group works, training, and encouragement) can be conduct to enhance the cooperation among members in a supply chain aspect. Vanichchinchai, (2012); (7) The relationship between green supply chain management and green human resources management is uncertain ,But Muduli et al. (2013) points out that the operation management cannot conduct without

human support. Ho et al. (2012) find out the negatives effects between this two variances in his qualitative method. However, Cantor et al. (2012) indicate that green employee management have positive effects on supply chain green performances. In order to test these unclear relationship, this article decide to use quantitative method to confirm it.(8) If the green practice combine with the traditional human management and supply chain, the relationship of the green study is effective. Renwick et al.,( 2013).(9) The supply chain practice can divide into two types: external and internal, company internal supply chain practices is the fundamental, thus company have to focus on company inner employee aspect. Renwick et al., (2013), (10) In the human resources green practice, it require company should give employee a clear green target and systematically training, in other words, it means there have a closed linkage of green supply chain management practices, because the investment recovery and ecological system design are require employee to eliminate the resources over consumption and reduces the pollution behavior impacts. Govindarajulu and Daily (2004). Sarkis et al.,(2010) agree with the viewpoint above.(11) The logistics reversion practice of supply chain management alsolink to the human contribution, require company hire the skillful worker who have sufficient knowledge and experience in green transportation design. Ho et al., (2012); de Sousa Jabbour et al., (2013). (12) The study opportunity and suggestion of the relationship between green human resources and green supply chain management practices is quantitative method analysis. After sufficient quantitative article reflect the result of study, the linkage will become more clear. Pagell and Shevchenko (2014). Thus, this article will use quantitative methodology to exam all of the hypothesis in chapter 3 and 4.

**Hypothesis 1:** Green staffing can improve the implementation of firms' green supply chain management.

**Hypothesis 2:** Green training can enhance the implementation of firms' green supply chain management.

**Hypothesis 3:** Green evaluation can improve the implementation of firms' green supply chain management.

**Hypothesis 4:** Green workgroup can improve the implementation of firms' green supply chain management.

**Hypothesis 5:** Green encouragement can improve the implementation of firms' sustainable supply chain management practices.

## GSCM and company performances

The key concept of environmental performances of this article can summarize like: it is the companies' administration results which focus on energy conservations and nature materials saved or pursue the pollution minimization, Seuring and Muller, (2008). Green supply chain management

have a direct effects on companies' environmental and operational performances. Seuring and Muller, (2008).

The operational definition is a outcome of the process of operationalization and is adoptfor defining something (Such as a variable, term, or object) in terms of a process (or set of validation tests) needed to determine its existence, duration, and quantity. Zhu, et al, (2004); Sarkis, et al (2011)

Green supply chain management have positive effects on operational performances, such as the enhancement in product line design , capacity and resources utilization, production quality standard, reduce the damage or scrap rate in manufacture process. Zhu, et al (2004). Compare with the literature review above, the GHRM have positive effects on GSCM, thus, it means the combination effects of this two variables will improve the operational performances of the company.

The reason for conducting Green supply chain management practices is that they can significantly enhance environmental performance. The evidences for proving this theory is quite clear. Such as the scholar Florida (1996) indicate that strong relationship between supply-side and demand-side, which can good for green merchandise development , companies can collaborate with suppliers to design high efficiency standard process by focusing common goals of ecological protection and minimize the inventory level and rare resources consumption, and finally, the entire negative of environment will reduce a lot. Geffen and Rothenberg (2000) point out that, firstly, company can focus on inner green administration to eliminate the bad effects on ecological, secondly, company can conduct survey or other practices to communicate with consumers and suppliers to respect and understand their demand for green design and goals, Thirdly, all of the stakeholders in supply chain procedure can solve the polluted problem together and reach win-win situation target in further development.

**Hypothesis 6:** Green supply chain management implementation can improving firms' environmental performances.

**Hypothesis 7:** Green supply chain management implementation can improving firms' operational performances.

Based on the literature review above, the conceptual framework of this study can develop as figure 1, target at investigating the relationship between Green human resources management and green supply chain management performances of resources-oriented company in Nanning city, Thus, from the conceptual framework, GHRM practices can enhance the GSCM implementation and improve companies' performances.

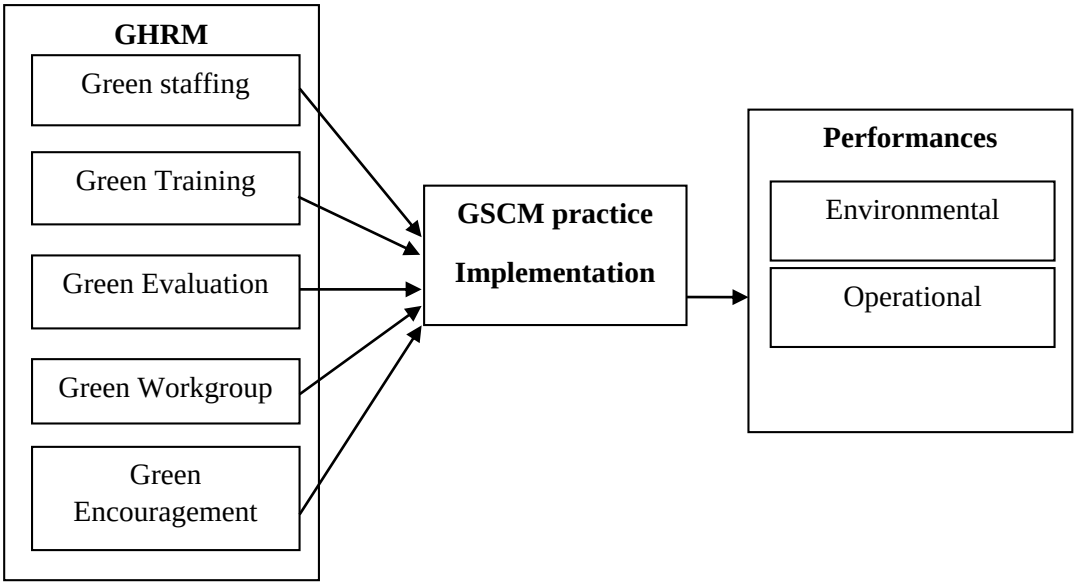


**Figure 1** Research Conceptual Framework

# Research methodology

## Population and sample

Population quantities (2015): 237,877 companies (The HUANG database statistics of the People's Republic of China, Nanning section 2010-2015) Based on literature review in chapter 2, questionnaire aimed at investigating the Nanning, Chinese resources-oriented company which belong to mental and chemical industry. However, in the sample size, include the company which no have basic information exposure, thus, the sample size will delete this group. The sample size for the study calculated according to the formula recommended by Yamane (1973).

According to N=237,877, e is 5% (at least 95% confidence level), It is means that the sample size is 400, so need to send at least 400 questionnaires in the plan, so this research decide to sent 470 questionnaires to increase the accuracy of the result.

## Research instrument

In order to reach the purpose of this research, quantitative method was conducted in this article, thus, questionnaire design is necessary. In this study, totally have 4 sections, and section 1 is demographic information, such as, age, gender, position, ect. In this article, the questionnaire was designed in English and Chinese language. And the tools that uses for this research was as following: (1) Questionnaire that use in this study, design information are from journal, thesis, statistics and other relative specific database. (2)

Questionnaire structure that use for this research are design as following: The design principle of part 2-4 follow the Likert Scale rules, divide by 5 standards, it is" Strongly Agree", "Agree", "Neither Agree Nor Disagree", "Disagree" and "Strongly Disagree". Measure like this:5= "Strongly Agree";4= "Agree";3= "Neither Agree nor Disagree ";2= "Disagree";1= " Strongly Disagree";The key issues and items were translate into Chinese language. The questionnaire section were developed in Appendix A.

## Data collection

The unit of research is resources oriented company in Nanning city of China. The researcher used convenience sampling method in collecting data at this industry companies employee which locate in five investment zone Nanning in China. The researcher distributed 470 questionnaires form June 25th to July 26th, 2016.The questionnaires were distributed by SOJUMP research institution which have official support certification letter and data quality control center, thus, SOJUMP are appropriate for use in the model and this article can make sure the questionnaires will fill out by the correct target sample, on the other hand, the participant of SOJUMP research institution also have access to the resources-oriented companies in each development district of Nanning, China and make sure this kind of sample companies had apply GSCM and GHRM practices(Such as the company which have to follow the environmental protection and polluted emission eliminate policy), based on the advantages of SOJUMP, this paper can increase the liability of data collection.

## Data analysis

The hypothesis of this study aim at investigating the relationship between GHRM and GSCM performance of company, thus, the independent and dependent variable of conceptual framework was analyze by Amos 23. In this part, this article will analyze hypothesis test by using structure equation modeling(SEM) which follow ML (maximum likelihood estimate) method, Exploratory factor analysis(EFA) and Confirmation factor analysis (CFA) were used in validity test to explore the theoretical framework and eliminate the single section into one score, KMO (Kaiser-Meyer-Olkin) must equal 0.5 as a minimal acceptance level. Bartlett test results must be significant. The significant measurement model fit indices results are:$0<\chi 2/df<3$,CFI>0.9,TLI>0.9,RMSEA<0.05.

**Table 1**Variable introduction

| The relationship between GHRM and GSCM practices implementation | |
|---|---|
| **Independent Variables(IV)** | **Dependent Variables(DV)** |
| Green Staffing | The implementation of green supply chain management practices |
| Green Training | |
| Green Workgroup | |
| Green Evaluation | |
| Green Encouragement | |
| The relationship between GSCM practices implementation and Companies' Performances(CP) | |
| **Independent Variables(IV)** | **Dependent Variables(DV)** |
| The implementation of green supply chain management practices | Companies' performances (CP)<br>Environmental performances<br>Operational performances |

# Analysis results

## Reliability test

Reliability test are target at measuring the clarity and repeatable extent Malhotra and Birks, (1999). It means that the results of the measurement have to consistent with repeated sequences extent of indicators measuring. The result of reliability measure will be high when the standard of consistency in repeated sequences indicators extent are also high.

**Table 2** Reliability test result

| **Variable** | A | α<br>**pretest** | **Number of items** |
|---|---|---|---|
| **GHRM** | 0.879 | 0.812 | 20 |
| **GSCM** | 0.882 | 0.857 | 12 |
| **CP** | 0.893 | 0.814 | 14 |

From the table above, if all the result of pre-test are greater than 0.7 Cronbach standard means that the questionnaire items are acceptable. Because of theαof GHRM (0.879), GSCM (0.882) and CP (0.893) were higher than 0.7, thus, all of the items are acceptable in this questionnaire.

## Validity test

### Exploratory factor analysis (EFA)

There are two reasons for this paper choose Factor analysis (EFA and CFA): Firstly, reducing the data structure. For this paper, GHRM (Green human resources management) are measure by many green HRM practices, and each green HRM practices are also measure by many small items, thus, Factor analysis can eliminate the single practices into one score. Secondly, Factor analysis can explore the theoretical structure, for example, is it GSCM (Green supply chain management) can measure by single factor or multiple factors or how many relatives factors have specific effects on it. Before conducting EFA (Exploration factor analysis), There have 2 tests are always used to check the appropriateness of data for factor analysis performance. thus, many paper suggested that KMO (Kaiser-Meyer-Olkin) must equal 0.5 as a minimal acceptance level. Bartlett test results must be significant. Based on the introduction above, the output of result can shows follows: This section will prepare for the SEM (structure equation modeling) analysis, which manipulated by ML (maximum likelihood estimate) method.

**Table 3** EFA of GHRM (5 factor model)

| Item | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| **a1** | | | | | .753 |
| **a2** | | | | | .814 |
| **a3** | | | | | .880 |
| **b1** | | .852 | | | |
| **b2** | | .862 | | | |
| **b3** | | .786 | | | |
| **b4** | | .789 | | | |
| **b5** | | .770 | | | |
| **c1** | | | | .877 | |
| **c2** | | | | .884 | |
| **c3** | | | | .862 | |
| **d1** | .836 | | | | |
| **d2** | .853 | | | | |
| **d3** | .870 | | | | |
| **d4** | .879 | | | | |
| **d5** | .885 | | | | |
| **f1** | | | .876 | | |
| **f2** | | | .826 | | |
| **f3** | | | .839 | | |
| **f4** | | | .844 | | |
| **% of variance** | 19.309 | 17.338 | 15.620 | 12.519 | 11.219 |
| **Cumulative of Variance%** | 19.309 | 36.647 | 52.266 | 64.786 | 76.005 |
| **KMO** | 0.863 | | | | |
| **Bartlett** | 5816.159 | | | | |
| **P value** | 0.000 | | | | |

From the output results, GHRM KMO=0.863(higher than 0.7), the same, GSCM KMO=0.910(higher than 0.7),CP KMO=0.922(higher than 0.7),and all of the Bartlett test is significant, it means that GHRM, GSCM, CP measurement model is suitable for factor analysis.

On the other hand, because of the loading on various factors(GHRM, GSCM, CP) is very high(-1 or 1), thus, Varimax rotation method was required, and the 5 factors cumulative of GHRM variance is 76.005%(higher than 50%), for factors cumulative of GSCM variances is 61.490(higher than 50%), for factors cumulative of CP variances is 61.490(higher than 50%) ,after rotating analysis, the loading value is higher than 0.5, it indicates that the GHRM, GSCM and CP measurement model is validity.

## Confirmatory factor analysis (CFA)

Because of EFA (exploratory factory analysis ) only concentrate on the single variables measurements' validity, but ignoring the causal relationship between dependent variables and independent variables, thus, the further examination CFA (confirmatory factor analysis) is necessary, such as the multiple analysis among green staffing, green training, green workgroup and green evaluation, green encouragement, which belong to GHRM variables.

**Table 3** GHRM model fitting index outputs

***CMIN***

| Model | NPAR | CMIN | DF | P | CMIN/DF |
|---|---|---|---|---|---|
| Default model | 50 | 370.772 | 160 | .000 | 2.317 |
| Saturated model | 210 | .000 | 0 | | |
| Independence model | 20 | 5914.294 | 190 | .000 | 31.128 |

***Baseline Comparisons***

| Model | NFI Delta1 | RFI rho1 | IFI Delta2 | TLI rho2 | CFI |
|---|---|---|---|---|---|
| Default model | .937 | .926 | .963 | .956 | .963 |
| Saturated model | 1.000 | | 1.000 | | 1.000 |
| Independence model | .000 | .000 | .000 | .000 | .000 |

***RMSEA***

| Model | RMSEA | LO 90 | HI 90 | PCLOSE |
|---|---|---|---|---|
| Default model | .054 | .047 | .061 | .176 |
| Independence model | .258 | .253 | .264 | .000 |

From the output result table above, the measurement model fit indices results are: $\chi 2/df=2.317$ $(0<\chi 2/df<3)$ CFI=0.963 (>0.9), TLI=0.956 (>0.9), RMSEA=0.054 (<0.08), all of the indices shows that, the GHRM measurement model is acceptable fit. The CFA analysis shows follows, and from the CFA figure of GHRM, the coefficient of each item is clear. The same, from the output result of GSCM, the measurement model fit indices results are: $\chi 2/df=1.902$ $(0<\chi 2/df<3)$, CFI=0.981 (>0.9), TLI=0.976 (>0.9), RMSEA=0.045 (<0.05), all of the indices shows that, the GSCM measurement model is acceptable fit. The CFA analysis shows follows, and from the CFA figure of GSCM, the coefficient of each item is clear.

From the output result of CP, the measurement model fit indices results are: $\chi^2/df=3.584$ $(0<\chi^2/df<5)$, CFI=0.959 (>0.9), TLI=0.950 (>0.9), RMSEA=0.076 (<0.08), all of the indices shows that, the CP measurement model is acceptable fit. The CFA analysis shows follows, and from the CFA figure of CP, the coefficient of each item is clear.

## Structure equation modeling (SEM) analysis

In this section, this paper will use ML (maximum likelihood) estimate method to analysis 453 questionnaires data, and list the outputs as follows:

**Table 4** Parameter estimates of path coefficients

| | | | Estimate | S.E. | C.R. | P |
|---|---|---|---|---|---|---|
| **GSCM** | <--- | GHRM | .675 | .087 | 7.777 | *** |
| **CP** | <--- | GSCM | .252 | .085 | 2.968 | .003 |
| **External practices** | <--- | GSCM | .933 | .122 | 7.634 | *** |
| **Internal practices** | <--- | GSCM | 1.000 | | | |
| **Green staffing** | <--- | GHRM | 1.000 | | | |
| **Green training** | <--- | GHRM | .527 | .077 | 6.880 | *** |
| **Green workgroup** | <--- | GHRM | .520 | .087 | 5.963 | *** |
| **Green encouragement** | <--- | GHRM | .859 | .095 | 9.075 | *** |
| **Green evaluation** | <--- | GHRM | .780 | .093 | 8.377 | *** |
| **Environment Performances** | <--- | CP | 1.000 | | | |
| **Operational Performances** | <--- | CP | 1.538 | .556 | 2.767 | .006 |

****means P<0.001*

*B means Standardized path coefficient*

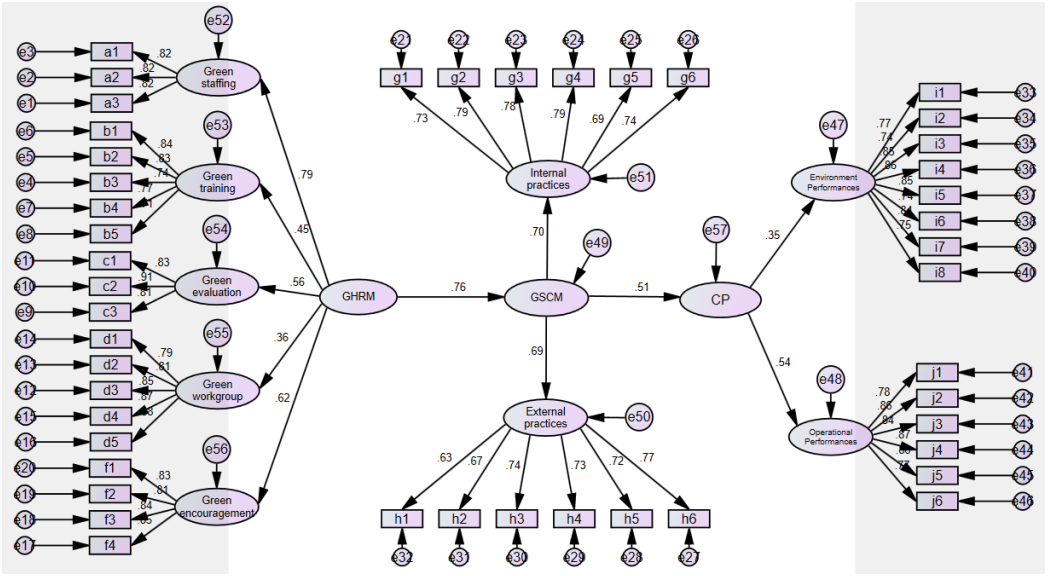


**Figure2** SEM model analysis

**Table 5** The modeling fitting

***CMIN***

| Model | NPAR | CMIN | DF | P | CMIN/DF |
|---|---|---|---|---|---|
| Default model | 103 | 1717.644 | 978 | .000 | 1.756 |
| Saturated model | 1081 | .000 | 0 | | |
| Independence model | 46 | 14390.779 | 1035 | .000 | 13.904 |

***Baseline Comparisons***

| Model | NFI Delta1 | RFI rho1 | IFI Delta2 | TLI rho2 | CFI |
|---|---|---|---|---|---|
| Default model | .881 | .874 | .945 | .941 | .945 |
| Saturated model | 1.000 | | 1.000 | | 1.000 |
| Independence model | .000 | .000 | .000 | .000 | .000 |

***RMSEA***

| Model | RMSEA | LO 90 | HI 90 | PCLOSE |
|---|---|---|---|---|
| Default model | .041 | .038 | .044 | 1.000 |
| Independence model | .169 | .167 | .171 | .000 |

According to the result of table above, The P value of each variable is significant $(P<0.05)$, it means that green staffing, green training, green workgroup, green evaluation and green encouragement have positive effects on Green supply chain management, thus, H1 to H5 was supported, green human resources

management can improve green supply chain management of company. On the other hand, GSCM also have positive effects on companies' performances (CP). H6 to H7 was supported.

From the output result table above, the measurement model fit indices results are: $\chi 2/df=1.756$ $(0<\chi 2/df<3)$, CFI=0.945 (>0.9), TLI=0.941 (>0.9), RMSEA=0.041 (<0.05), all of the indices shows that, the measurement model is acceptable fit.

# Discussion

## GHRM and GSCM

The purpose of this research was to investigate the relationship between green human resources management (GHRM) and Green supply chain management (GSCM) and Companies' performances (CP).

From the results of SEM(The loading), this paper can find out that, H1 is significant than other items, which means green staffing is an important step in GHRM, and Nanning resources-oriented company have to focus on this practices. Jabbour et al, (2010) point out that staffing or recruitment can support company to hire excellent and appropriate employee to eliminate the pollution, and it is significant for green company. Based on the analysis above, this paper can confirm the effects of Green staffing. The result of SEM analysis shows that the H1 to H5 was supported, which means green human resources management can improve the green supply chain management implementation of company, thus, human resources management in supply chain management process is necessary, Gunasekaran,et al, (2012).

Some scholars, Muduli et al, (2012) points out that the relationship between green human resources management is uncertain, but companies operation management cannot conduct without human resources support. Obviously, the result of SEM in chapter 2 provide an important evidence.

There are many scholars emphasize that human resource management plays an important role in compies' environmental performances, it is the definition and features of GHRM, Daily et al, (2001), Thus, the traditional human resources management cannot leave the design of green ecological development, Daily and Huang, (2001), such as using staffing the green skill workers and setting environmental target and responsibilities for them, evaluating and encouraging them when workers have a good performances on environmental protection process. on the other hand, Boks, (2006) also points out that, workers' perspective are the important stage for the implement of better ecological protection practices.

## GSCM and companies' performances

The SEM result shows that, the H6 to H7 was support, GSCM have positive impact on firms' performances, and thus, company can enhance their operational and environmental performances by conducting more GSCM. Because of the definition of GSCM and GHRM, this article only focus on these two performances, for GHRM, it require

company to improve the environment situation and GSCM concept emphasize company cannot conduct operational management without human resources support. Zhu, et al, (2004) indicates that if company use green supply chain management practices, the production line and inventory can reach the optimize level, thus, the totally cost of company will reduce, it is good for companies' future development. Zhu, el al, (2013) prove the hypothesis in his empirical analysis paper, and he also points out that the GSCM can contribute to the capacity and resources utilization of company.

# Conclusion

This study aim at investigating the relationship from GHRM to GSCM and companies' environmental performances and operational performances, and the target group of this study is the resources-oriented company in Nanning city of China, thus, the questionnaire method is required, In data collection process, this paper totally distributed 470 questionnaires, and 453 can use. In data analysis part, this study use EFA and CFA method to examine the validity of each measurement model and conduct the structure equation modeling (SEM) to confirm the regression results. For questionnaire demographic (453 samples), this paper find out that the gender category consist of 302 male respondents (66.7%), and 33.3% female respondents (n=151), it means that in Nanning resources oriented industry, the male worker is majority group. The age respondents rate indicates that most of the workers are 35-44 years old (38.2% of the respondents). This paper also finds that the largest group of education level category is bachelor degree, which consist of 51.9%. For company ownership types, most of the respondents are come from state-own company (62.7%), thus, it means that, in Chinese resources-oriented industry, government have intervention behaviors, especially for oil and gas industry (39.7% of the respondents), which more rely on rare nature resources. Based on the analysis, H1 to H7 was supported, it means GHRM have positive effects on GSCM and companies' performances, the conceptual framework is significant. For supplier and customer perspectives, they can understand more about green notion and conducting the appropriate practice in HRM and SCM.

# Implication

Firstly, the future study can expand the research area to another city or different country, and gain the better study results that based on deferent culture and industry background. Secondly, the Future research can focus on different area, not only for resources-oriented company, but also for some emerging industry. Thirdly, the future study may include more variables and research items for company performances, such as economic performances and financial performances. More data analysis method it is required. Lastly, For MANOVA data analysis method, future study may continue to use and separate the GHRM and GSCM measurement model into several groups, and analysis the effects of single practice item(such as green staffing or green encouragement),

thus, finally can find out which green human practices have the most significant effects on supply chain management, then propose the relatives suggestion to company and help them to choose the most important green human resources management practices to save the total cost of investment.

# Limitations & further research

First of all, this study concentrate on resources-oriented industry, this large industry have many small unit, the features of each unit's background, such as supply chain and human resources management may different, especially for state-own company in Nanning, China. thus, these factors is hard to explain and control in these paper. Other than that, this article uses limited number of variables, such as GSCM also can measure by Reverse logistics. Lastly, the respondents of this study only focus on the resources-oriented companies' employee in Nanning, China, But the questionnaire items is too long, the emotional factors cannot control in this study. The future study can expand the research area to another city or different country, and gain the better study results that based on deferent culture and industry background. Secondly, the Future research can focus on different area, not only for resources-oriented company, but also for some emerging industry. Thirdly, the future study may include more variables and research items for company performances, such as economic performances and financial performances. More data analysis method it is required.

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# Appendix 1

## GHRM and GSCM outcomes questionnaire (English version)

This is a survey about green human resources management effects on green supply chain management and companies' performances, which in Nanning, China. It will contribute towards finding the proper way in managing the supply chain to enhance operational effectiveness and environmental sustainability. This questionnaires is part of data collection in my dissertation. As an MBA student, I am grateful to have your participation in this survey.

Thank you for your participation, this questionnaire only for survey and scholar research, not involve in commercial purpose. This questionnaire totally have 4 sections, consisting of 54 questions

### **Section 1** Basic information

Please kindly specify the most appropriate option of each statement which correspond most closely to your desired response.

Can use symbol "√" to answer it.

**(1) What is your gender?**

☐ Male ☐ Female

**(2) What is your age?**

☐ 18-24 ☐ 25-34

☐ 35-44 ☐ 45-54

☐ 55-64 ☐ 65 or over

**(3) What is your education level?**

☐ High school/Lower ☐ Bachelor degree

☐ Master degree ☐ Doctor degree

**(4) How long is your working experiences?**

☐ <1 Year ☐ 1-5 Years

☐ > 5 Years

**(5) What is your company ownership types ?**

- ☐ State-owned company
- ☐ Private Chinese company
- ☐ Foreign or Joint ventures

**(6) What is your company size?**

- ☐ <300
- ☐ 300-2,000
- ☐ > 2,000

**(7) Which industry dose your company belong to ?**

- ☐ Coal mining industry
- ☐ Oil and gas industry
- ☐ Ferrous metal industry
- ☐ Non-ferrous metal industry
- ☐ Non-metallic mineral industry
- ☐ Not belong to the industry above_____

**(8) What is your position ?**

- ☐ Supervisor/Management
- ☐ Maintenance
- ☐ Customer Services
- ☐ Clerical
- ☐ Other_____

## **Section 2** Green Human Resources Management **(**GHRM**)**

**Green human resources management (GHRM) means the human management method which combine with green notion practices, and focus on the environmental performances of company. (The "green" can be defined as environmental protection or pollution elimination.)** Please kindly specify the most appropriate scale of each statement which correspond most closely to your desired response.

Please check（√） in one of the boxes below in the following scale:

5= "Strongly Agree";
4= "Agree";
3= "Neither Agree nor Disagree ";
2= "Disagree";
1= "Strongly Disagree";

| **Our company apply these green human resources method as follow:** | **Level of agreement** | | | | |
|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** |
| (1) Our company eliminates paper in recruiting materials | | | | | |
| (2) Our company encourages employees to participate in Green recruitment design (Such as letting employee to prepare solution in recruitment materials waste) | | | | | |
| (3) Our company recruits employees who are "green aware" | | | | | |
| (4) Our company emphasizes the significance of green notions when training employees(such as how their jobs specifically affect the environment) | | | | | |
| (5) Our company uses lots of images in green training materials | | | | | |
| (6) Our company encourages workers to design their own green training materials | | | | | |
| (7) Our company has green awareness, skill and expertise training | | | | | |
| (8) Our company has training for green jobs, and integrated training to create an emotional involvement in environment protection | | | | | |
| (9) Our company sets green performance indicators include in appraisals and performances management system | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| (10) Our company sets green targets, goals, and responsibilities. | | | | | |
| (11) Our company sets objectives on achieving green outcomes included in appraisals | | | | | |
| (12) Our company appraises low-carbon champions and green action teams | | | | | |
| (13) Our company supports to help employees attain their goals. (For example, firms dedicated work hours for environmental activities) | | | | | |
| (14) Our company collects organizational and benchmarking information to determine which employees or team extra-role behaviors will have the greatest positive effects on the environment | | | | | |
| (15) Our company provides forums for employees to network and share their experiences, suggestions, and successes in green activities | | | | | |
| (16) Our company provides recognitions or small gift rewards to successful teams or employees | | | | | |
| (17) Our company encourages managers to include green tasks and goals in employee work goals and job | | | | | |
| (18) Our company provides a portion of any monetary savings attained on green initiatives back to the employees or team that achieved them | | | | | |
| (19) Our company encourages employees to make suggestions for environment management improvement | | | | | |
| (20) Our company provides monthly managerial bonuses for good environment management | | | | | |

## **Section 3** Green supply chain management **(**GSCM**)** practices

**Green supply chain management (GSCM) is the supply chain system which focus on the high standard of enhancement in environmental protection or green sustainability notions.** Please kindly specify the most appropriate scale of each statement which correspond most closely to your desired response.

Please check（√） in one of the boxes below in the following scale:

5= "Strongly Agree";
4= "Agree";
3= "Neither Agree nor Disagree ";
2= "Disagree";
1= "Strongly Disagree";

| **Our company applies the green supply chain management practices as follow:** | **Level of agreement** | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| (1) Our company designs products for reuse, recycle, recovery of material, component parts | | | | | |
| (2) Our company designs products for reduced consumption of materials/energy | | | | | |
| (3) Our company designs products to avoid or reduce the use of hazardous of products. | | | | | |
| (4) Our company has investment recovery(sale) of excess inventory/materials | | | | | |
| (5) Our company sells scrap materials and used materials | | | | | |
| (6) Our company sells excess capital equipment | | | | | |
| (7) Our company requires suppliers to provide ISO 14000 certification | | | | | |
| (8) Our company collaborates with suppliers for environmental objectives | | | | | |
| (9) Our company collaborates with suppliers for eco-design | | | | | |
| (10) Our company adopts third-party-logistics | | | | | |
| (11) Our company collaborates with Consumers for green packaging | | | | | |
| (12) Our company collaborates with consumers for eco-design | | | | | |

## **Section 4** Company performances

Please kindly specify the most appropriate scale of each statement which correspond most closely to your desired response. Can use symbol "√" to answer it.

Please check（√） in one of the boxes below in the following scale:

5= "Strongly Agree";

4= "Agree";

3= "Neither Agree nor Disagree ";

2= "Disagree";

1= "Strongly Disagree";

| **Environment performances** | | | | | |
|---|---|---|---|---|---|
| **When we engage in environment practice, We contribute to** | **Level of agreement** | | | | |
| | **1** | **2** | **3** | **4** | **5** |
| (1) Improve company's environment situation | | | | | |
| (2) Reduction of Air emission | | | | | |
| (3) Reduction of waste water | | | | | |
| (4) Reduction of Solid pollution | | | | | |
| (5) Decrease in use of nature resources | | | | | |
| (6) Decrease of consumption of hazardous/ harmful/toxic materials | | | | | |
| (7) Decrease of frequency for environment accidents | | | | | |
| (8) Increase in energy saved due to conservation and efficiency improvements | | | | | |
| **Operational Performances** | | | | | |
| **When we engage in operational practices, We contribute to** | **Level of agreement** | | | | |
| | **1** | **2** | **3** | **4** | **5** |
| (9) Increase amount of goods delivered on time | | | | | |
| (10) Decrease inventory levels | | | | | |
| (11) promote products quality | | | | | |
| (12) Increase production line | | | | | |
| (13) Improve capacity utilization | | | | | |
| (14) Decrease Scrap rate | | | | | |