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Role of Green Resource Management in Advancement of Green Supply Chain (Case Study for Environmental Engineering)

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ABSTRACT

In a situation where manufacturing companies are under intense competition, they are producing a variety of products, and sometimes they do not pay attention to the environmental costs of using different materials. However, the implementation of environmental management practices such as green supply chain management can help to prevent environmental pollution, in addition to maintaining the competitive advantage of companies. This research investigates the role of green human resources management in promoting greenhouse gas supply goals at the compost recycling plant in Isfahan industrial city. In this study, a conceptual model related to green supply chain management and factory business performance was used through three organizational variables: job satisfaction, operational efficiency, and inter professional productivity as intermediaries. Statistical analyzes based on data collected through A total of 92 questionnaires were conducted in the disposable utensil industry. Reliability and validity of the research model and questionnaire were tested and confirmed. In order to test the hypotheses, partial least squares technique has been used in the structural equation model. Some of the previous findings of this study suggest a direct relationship between the implementation of green human resource Management and the business performance of a factory. All research hypotheses were approved in the form of green human resources management and related factors. In general, the findings of this study are consistent with previous studies in other parts of the world. Also, few studies in this area were conducted based on the theory of resource dependency.

1. Introduction

Green supply chain management seeks to change the traditional linear supply chain model from suppliers to customers and tries to integrate recycling into supply chain management (Ahi and Searcy, 2013). By doing this; you can have a closed loop with chain-chain mode. If a company uses green supply chain management, in addition to solving environmental problems, it will also achieve relative victory in a competitive advantage (Bhadauria et al., 2014). In addition, the implementation of green supply chain management can avoid green barriers in international trade. Many large foreign companies such as General Motors, Hewlett-Packard, Procter & Gamble, Nike and ... have earned a reputation and a good brand name for green products through the research and implementation of Green Supply Chain Management (Green et al., 2012).The emphasis on green human resources management is on the philosophy, policy, and activities that the organization has followed in order to manage the environment, and personnel affected by green human resources and the stages of 'Green socialization' under the heading of the 'Green-collar' personnel are known. These personnel are people who are sensitive and committed to their surroundings and who consider themselves an active member of the community (Ahi and Searcy, 2013). Personnel with appropriate environmental knowledge and sensitive to it have key implications, including effective use of resources, reduction of waste, and reduced pollution of the workplace (Bhadauria et al.,

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2014).On the other hand, simple, expert, and skilled personnel all tend to be hired in an organization that is sensitive to and respectful of its environment. So-called these kinds of organizations, called ‘green organizations’. Green organizations are organizations that through the managers and experts of human resources have implemented the green socialization steps well for all employees and committed them to the environment, and ultimately made an important achievement, such as ‘equalization’ Green values ‘between the organization and the personnel. Environmental considerations, combined with supply chain management, will provide a win-win position for organizations and help them achieve a strong global market advantage (through cost reduction and competition improvement) (Ahi and Searcy, 2013).

2. Material and Methods

2.1. Theoretical fundamentals of research

In today's competitive world, given the characteristics of new production environments and the nature of customers, other past production management practices that have been less integrated in their activities have lost their effectiveness, and companies today need to integrate neatly in all production processes of matter Crude to the final consumer and supply chain management as an integrated event for the proper management of the flow of materials, goods, information, knowledge and monetary flow has the ability to respond to these conditions (Green et al., 2012). Environmental management, with an emphasis on environmental protection, has been redirected to one of the most important issues of customers, stakeholders, governments, employees and competitors. However, global pressures also require organizations to produce environmentally-friendly products and services. These challenges have led to the emergence of a new concept of Green Supply Chain Management in the business area (Stevels, 2002).The supply chain is a chain that involves all activities related to the flow of goods and the conversion of materials from the stage of provision of the raw material to the stage of delivery of the final product to the consumer. On the flow of goods, there are two other flows, one of which is the flow of information and the flow of funds and credits (Sarkis et al., 2011).Supply chain management involves all management activities that help meet customers' needs by minimizing costs for all companies involved in the production and delivery of products and services to customers (Ahi and Searcy, 2013). According to Porter's Value Chain, the supply chain involves all activities required to provide a product or service to the end customer (Bhadauria et al., 2014). According to this theory, the supply chain in a simple definition includes all the activities required to provide a product to the end customer, and supply chain management is actually managing these activities in the supply chain.

In the 60s-70s, organizations were trying to increase their competitive ability by standardizing and improving their internal processes, producing a better quality product and lower cost. At that time, the prevailing thinking was that robust engineering and design, as well as coherent production operations, was the prerequisites for market demands and thus more market share, so organizations focused their efforts on increasing efficiency and mass production they paid (Jamali, 2010). In fact, the designer of these systems is Henry Ford. This type of production system, which is an example of continuous systems, is produced in high volumes, and certain standards are set for product parts (Stevels, 2002). In the 1980s, with increasing diversity in customer expectations, organizations increasingly became more interested in increasing flexibility in product lines and developing new products to meet the needs of their customers and delivering flexible production (Jamali, 2010).

In the early 1990s, along with improvements in the production processes and the use of reengineering patterns, many industry managers found that to maintain market presence, only improving internal processes and flexibility in the company's capabilities was not enough, but the suppliers of components and Materials should also produce materials of the best quality and least cost, and distributors of products should also be closely associated with market development policies that use terms such as timely production and lean production (Bhadauria et al., 2014). On the other hand, there is no single approach to cost reduction and quality enhancement systems today, and there is no need for more industry. This requirement is related to environmental issues. Some industries, such as the compost industry, are always problematic due to the lack of compatibility with the environment, and they are protected by environmentally friendly organizations and the environmentally friendly people. This is a catastrophic and extremely horrific result for developing countries and the third world, which still have an environmental issue that is not central to them (Ahi and Searcy, 2013).Green supply chain management addresses all the issues raised and broadens their categorization as quantitative and qualitative tools such as location, logistics and transportation, inventory and forecasting, marketing, marketing and supplier management, information, design Product and introduction of new products, support and after sales services, reverse logistics and green issues, strategic alliances and outsourcing, material and quantifiable issues, and endeavors to implement the effects of industrialization and green automation, and It is a factor in reducing and minimizing environmental issues (Green et al., 2012).

Green Supply Chain Management was introduced by the Industrial Research Association of the University of Michigan in 1996, which is actually a new management model for environmental protection. Green Supply Chain Management is a product lifecycle perspective that includes all stages of raw materials, product design and manufacturing, product sales and transportation, product use, and product recycling. Using supply chain management and green technology, the company can reduce environmental negative impacts and achieve optimal use of resources and energy (Sarkis et al., 2011).

Greening the supply chain is the process of taking environmental measures or considerations throughout the supply chain. Green Supply Chain Management, Integrating Supply Chain Management with environmental requirements at all stages of product design, choosing and supplying supply chain greening is the process of meeting environmental criteria or considerations throughout the supply chain (Stevels, 2002). In the 1990s, along with the improvement in production capabilities, industry managers realized that the materials and services received from different suppliers had a significant impact on increasing the organization's capabilities in order to meet the needs of

customers, which in turn itself, had a drastic impact on the organization's focus and supply bases and source strategies. Managers also found that the mere production of a qualitative product was sufficient, in fact, the supply of products with the desired criteria of the customer (when, where, how), and the quality and cost of their desired new challenges. In such a situation, as a conclusion of the changes, they found that these changes were not enough to manage their organization in the long run. They should be involved in managing the network of all the factories and companies that directly and indirectly import their organization's inputs, as well as the network of companies involved in the delivery and after-sale services to the customer. With such an approach, supply chain and supply chain management approaches have come to fruition (Ahi and Searcy, 2013). In Fig. 1, the proposed components of the management of supply chain green supply are considered.

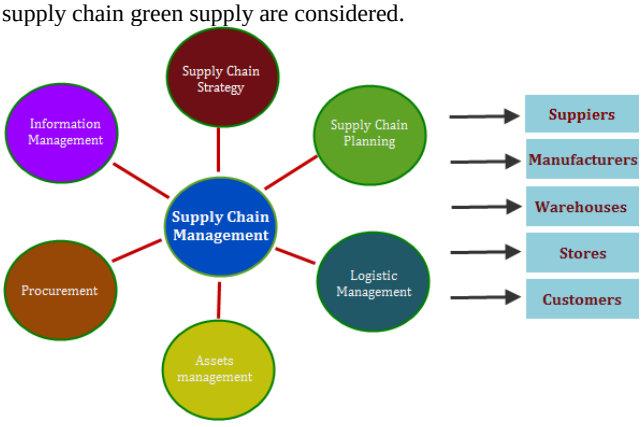

Figure 1. Green Supply Chain Management Resources Components

2.2. Green Human Resources Management

Green Human Resources Management is responsible for creating awareness, information and interaction among the organization's personnel about the environment and environmental factors, and through policy-making and green policies, they lead to social responsibility among them and lead them in such a way. They will fulfill their duties and obligations towards the environment. These activities, in addition to leading to efficiency and effectiveness, reduce costs; create collaboration among staff and sustainability. It also creates a competitive advantage for the organization (Ahi and Searcy, 2013). The goal of green human resources is to create conditions as an important role in designing sustainability for different organizations. Therefore, green organizations should lead all factors (manufacturing, economic, service, customers) to the same direction as environmental protection and the natural benefits of organizational efficiency, so the responsibility of the younger generation of human resource managers Creating awareness among young people and among people working for the organization about managing green resources (Sarkis et al., 2011). Therefore, it is essential to identify and develop the features and capabilities of human resources in organizations that lead to green organization, green management and green human resources in achieving environmental goals and ultimately green human resources management (Bhadauria et al., 2014). According to some studies on green human resources management, the following are widely emphasized (Ahmad, 2015):

- Human resources techniques are important for the implementation and maintenance of environmental management systems,
- Human aspects are important for adopting more advanced environmental techniques,
- Developing products with lower environmental impact requires human resource support,
- Environmental education is one of the main ways through which human resources support environmental management.

There is a consensus that green human resource management is created through the implementation of human resources techniques and with the objectives of environmental management. In the same content, Renwick et al. (2013) state that each stage of the environmental management system (from environmental policy to results analysis) requires specific support for a human resource technique with an emphasis on recruitment, selection, training, assessment Efficiency, and rewards for employees. These techniques are not only relevant to support environmental management systems, but also to support the development of products and innovations with fewer environmental impacts. Muller-Carmem et al. (2010) also argue that appropriate support for human resource management requires the strategic inclusion of human resources in the decision-making process related to the environmental aspects of the organization. Conceptual studies, combined with the studies by Jackson et al. (2011), Renwick and colleagues (2013), in the field of human resource management, Green Paper, have been considered as a full-blown and fully successful approach. It should be noted that until 2008, human resource integration and unnamed environmental management were introduced by Jackson et al. (2011) as a fully functional field. This new area is integrated more systematically with human resources research programs and includes a coherent management.

2.3. Methodological principles

The surveys can be exploratory, descriptive, or in order to test the hypotheses. When a research is explored explicitly about the situation we are facing, there is not enough information on how to deal with it or its background, exploratory. A descriptive study is to determine and describe the characteristics of the variables in a given state and hypothesis testing studies usually try to explain the nature of particular relationships, or the differences between groups or the independence of two or more factors in Explain a situation (Chinifrosh and Sheykhzadeh, 2009).The approach used in this study is a type of descriptive study that has been implemented in a specific case. A descriptive study of what is described and interpreted and refers to the conditions and relationships that exist, common beliefs, current processes, apparent effects, or growing trends. The characteristics of the studied community are evaluated through a variety of approaches such as surveying (surveying is the gathering of information that is mapped and described as a guide to describing or predicting and analyzing the relationships of some variables) (Jamali, 2010). This approach is highly regarded due to consistent and successful

application of statistical analysis methods and provides acceptable results.

In this research, a conceptual model related to green supply chain management and factory business performance, was used through three organizational variables: job satisfaction, operational productivity and relationship efficiency as intermediaries. Statistical analyzes based on data collection. The survey was conducted on 92 questionnaires in the disposable utensils industry. Reliability and validity of the research model and questionnaire were tested and confirmed. In order to test the hypotheses, partial least squares technique has been used in the structural equation model. Questionnaires have been prepared as standard by Lee et al. (2012).The method of information analysis and modeling will be based on SPSS and EQS software. SPSS is one of the most widely used software for statistical analyzes, and EQS is also known as one of the most powerful software modeling tools. The description and analysis of the data in this research have been implemented in two levels of data description and analysis of data from descriptive survey and questionnaire scanning operations in Isfahan industrial city.

3. Results and discussions

As described in the previous section, the information was compiled, classified and evaluated in two levels of descriptive statistics and quantitative analysis and modeling. Figure (2) presents the basic classification for the study area. Analyzes are based on this process.

3.1. Descriptive and adaptive

Based on the results of questionnaire data extraction, the age of the respondents was divided into 4 groups: 30, 30-40, 41-50, and over 50, among which the highest number .The respondent was 36 years old (39.1%) with the age group fewer than 30 years old and the lowest number of respondents was older than 50 years old with 4 respondents (4.3%). This is presented in Fig. 3. Of the female respondents, 16 (17.4%) are formed, and the number of men is 76 (82.6%). The underlying causes and problems of social participation reduce the participation of women in the study. This problem is shown in Fig. 4. Regarding the level of education of respondents from 92 people, the highest number of respondents was related to the status of bachelor's degree with 43 (46.7%) and the lowest number was related to the master's degree with 14 (15.2%) The respondent is shown in Fig. 5. Of the 92 respondents, the highest number of respondents was executive officer with 35 (38%) and the lowest number of job title middle managers with 27 (29.3%), as shown is brought in Fig. 6.

In order to assess the environmental capability and responsibility of the personnel towards the environment, the following questions have been asked and the results have been prepared in graphical form. The results have been answered with a very inappropriate answer, as it has been determined. Of the 92 respondents, 40 (43%) responded positively to this question (i.e., they were familiar with the management of green human resources), and the number 52 people (57%) have answered this question negatively (i.e. they are not aware of the management of green human resources). Unfortunately, people with positive responses are ranked lower in organizational terms. On the other hand, from 92 respondents to the second question, 18 (20%) responded positively to this question, and 74 (80%) responded negatively to this question, which indicates that there is no implementation Green management is in the evaluated companies. These results are shown in Figs. 7 and 8.

- Do you know about environmental management plans?
- Do you approve these programs at your company?

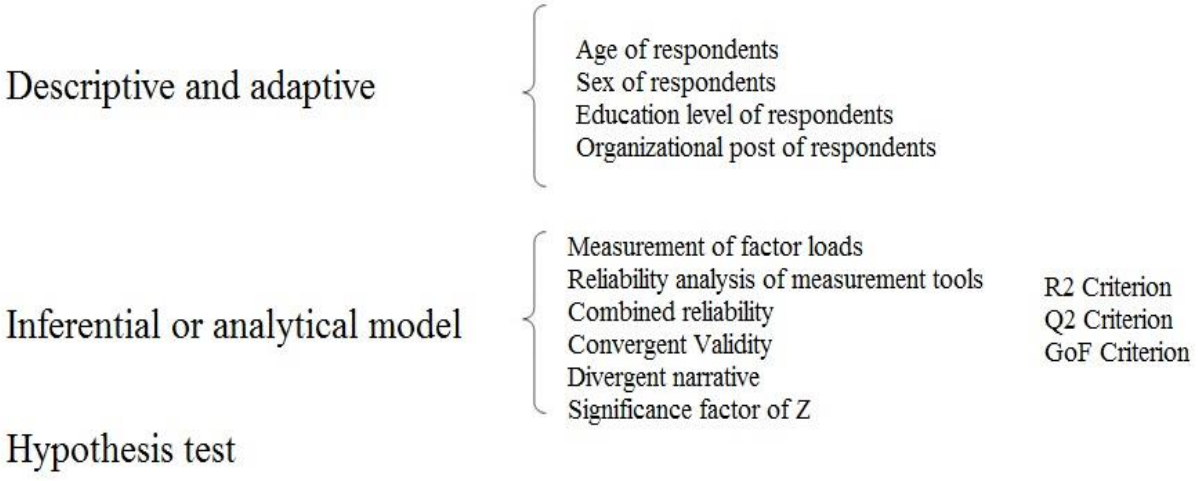

Figure 2. The Green Process Analysis in Two-Level for Isfahan Industrial Town

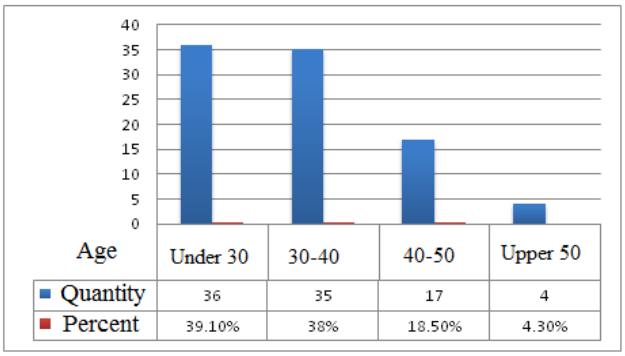

Figure 3. The age variations of the personnel under study

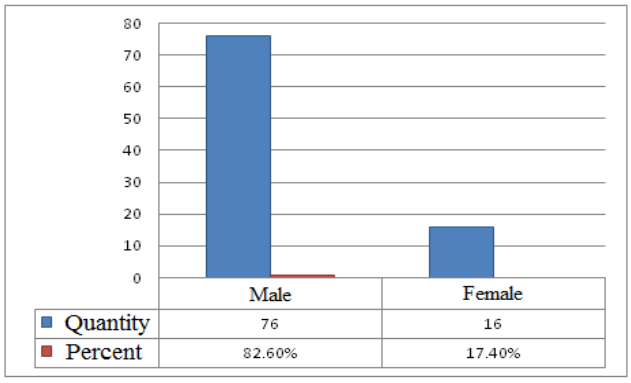

Figure 4. Sexuality of the personnel under study

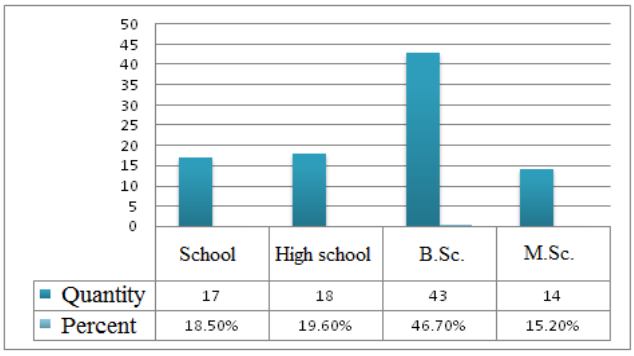

Figure 5. Education level of the personnel under study

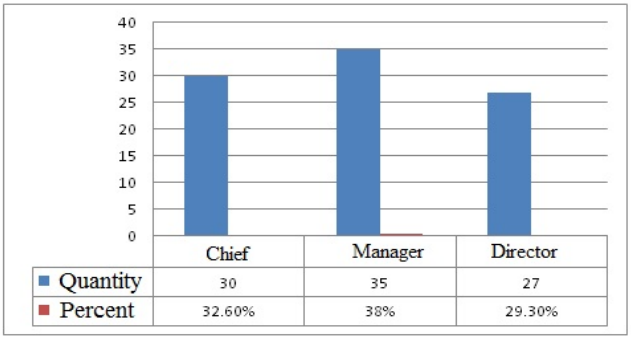

Figure 6. Changes in organizational staff grades of the personnel under study

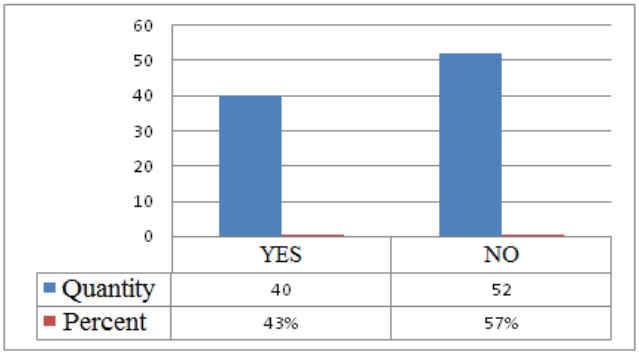

Figure 7. Knowledge of environmental management plans

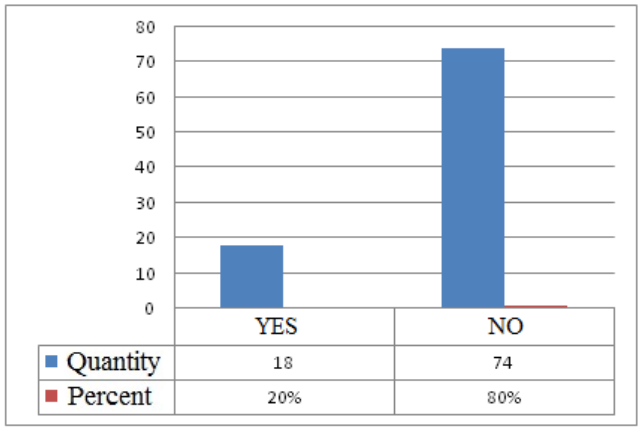

Figure 8. Implementation of environmental management plans at the company

3.2. Inferential or analytical model

The following approaches are considered in order to quantitatively evaluate and construct the synthetic model based on the information obtained from the questionnaires submitted to personnel of Isfahan industrial companies in the field of environmental recursive activities of the compost cycle.

- Measurement of factor loads,
- Reliability analysis of measurement tools,
- Combined reliability,
- Convergent Validity,
- Divergent narrative,
- Significance factor of Z,
- R2 Criterion,
- Q2 Criterion,
- GoF Criterion,

Measurement of factor loads (Power Relationship between Agent or Hidden Variable and Visible Variable by Factor Load) is a factor load between zero and 1. If the factor load is less than 0.4, then the weak relationship is considered And the factor load is 0.4 to 0.6 is acceptable and if it is greater than 0.6 it is very desirable), path coefficient or beta coefficient (indicating the severity and type of relationship between the two variables Is a number between 1 and 1+ which, if it is equal to zero, indicates that there is no linear relationship between the two hidden variables, which indicates the correlation between the two hidden variables (and The explained variance, or R2 (the numbers inside

the ellipsoid indicate the variance explained, actually indicate that several percent of the variation of the dependent variable is explained by the independent variables). The analytical model provided for measuring factor load is shown in Fig. 9. This model has been implemented for the companies studied as shown in Fig. 10. As you can see, the problem of the management factor has caused the complexity process to be a factor in the traditional control of the system.

The reliability analysis of the measurement tool is based on the quantitative analysis of the factors of the factor load complexity. According to the data analysis algorithm, after calculating the factor loads, the questions are asked to calculate and report the Cronbach's alpha coefficients and the combined reliability. In Table 1, information on the Cronbach's alpha is presented with the main components of the study. In the case of Cronbach's alpha, as shown in the table below, all hidden variables have alpha coefficients greater than 0.7 which represent fit for the modeling models. After examining Cronbach's alpha, it is a turn to the combined reliability coefficients. Since the Cronbach Alpha Criterion is a traditional criterion for determining reliability. This benchmark was introduced by Renwick (2010) and its superiority to Cronbach's alpha is that reliability is calculated not in absolute terms but in relation to their correlations. Both of these criteria are used to better measure reliability in the EQS software. Table 2 shows the combined reliability coefficients of the five hidden variables of green supply chain management, personnel satisfaction, operational efficiency, relationship productivity, factory performance, and since all of them are above 0.7, appropriate fit for measuring models is confirmed.

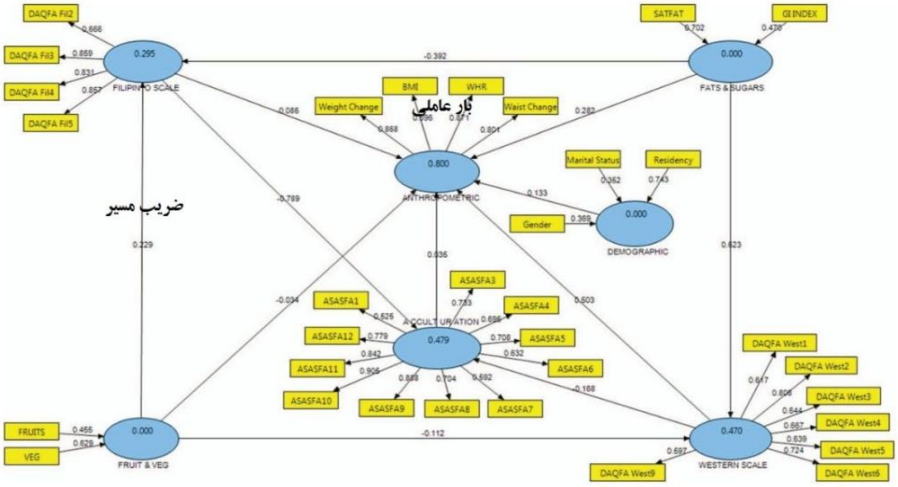

Figure 9. Knowledge of environmental management plans

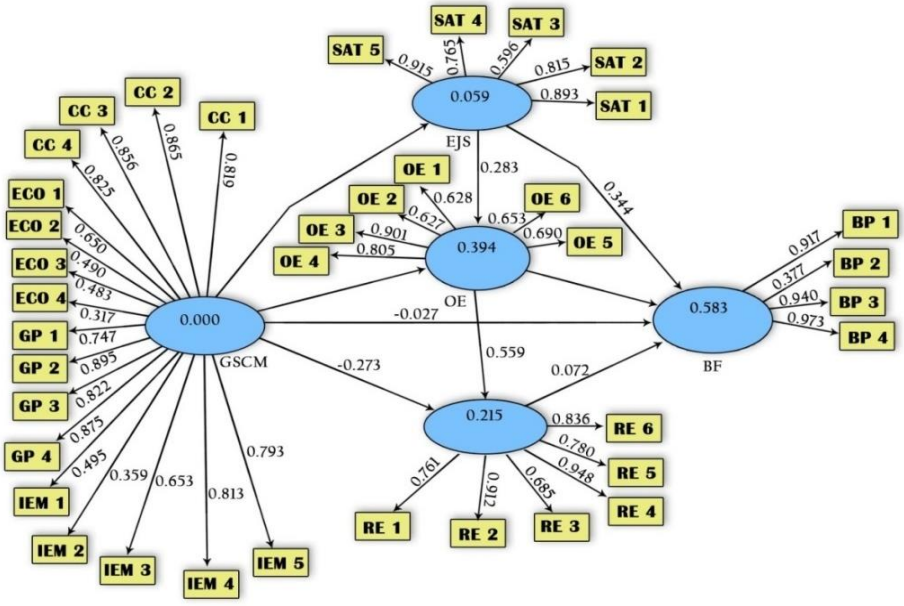

Figure 10. Knowledge of environmental management plans

Table 1 Quantitative of Cronbach Alpha

Factoral Parameters	Cronbach Alpha
Green Supply Chain Management	0.947
Personnel Satisfaction	0.864
Operational efficiency	0.829
Relative productivity	0.903
Factory performance	0.944

Table 2 Quantitative of Combined reliability

Factoral Parameters	Combined reliability
Green Supply Chain Management	0.951
Personnel Satisfaction	0.898
Operational efficiency	0.867
Relative productivity	0.927
Factory performance	0.964

Another criterion for measuring the fit of measuring models is convergent validity, which examines the correlation of each factor with its own questions (indexes). The mean value of the variance extracted by EQS software is used for this purpose. As the results of Table 3 show, in hidden variables of green supply chain management, staff satisfaction, operating efficiency, relationship productivity, factory performance, the value of this index is more than 0.5, which is indicative of Fit is a good model. Table 4 is the same as the Fornell Larcker matrix, with the difference that in the main diameter of the root mean value of the variance extracted variables are entered, and the other is that only the first-order hidden variables are entered in the Fornel Larcker matrix. In accordance with the following matrix, the value of the crude mean of the extracted variance of all first-order variables is greater than the correlation between them, which indicates a proper divergent validity and good fit of the measurement models.

Table 3 Quantitative Quantities of Average Extracted Variance

Factoral Parameters	Average and extraction variances
Green Supply Chain Management	0.573
Personnel Satisfaction	0.643
Operational efficiency	0.525
Relative productivity	0.681
Factory performance	0.899

The first criterion for fitting the structural model is the significance coefficients z (t-value). The fitting of the structural model using coefficients t is such that these coefficients should be greater than 1.96 in order to verify their 95% confidence level. With respect to the z values obtained from the studies shown in Table 5, the value of t for all questions is greater than 1.96. Therefore, they remain in the model and are statistically confirmed at a significant level of 95%. Also, in Fig. 11, an analytical model is provided with meaningful z coefficients.

Table 4 Values Validity Matrix by Fornel and Larker

Factors	Green Supply Chain Management	Personnel Satisfaction	Operational efficiency	Relative productivity	Factory performance
Green Supply Chain Management	0.757	0.238	-	-	0.347
Personnel Satisfaction	-	0.802	-	-	0.587
Operational efficiency	0.552	0.406	0.725	-	0.690
Relative productivity	0.044	0.346	0.405	0.825	0.375
Factory performance	-	-	-	-	0.948

Table 5 The z-value coefficients of the model paths

Model paths	t-value
Green Human Resource Management to Personnel Satisfaction	3.202
Green Human Resource Management to Operational Productivity	9.735
Green Human Resource Management Ratio to Productivity	2.562
Green Human Resource Management to Factory Performance	1.971
Personnel satisfaction path to factory performance	6.692
The path of personnel satisfaction to operational efficiency	4.717
The path of operational efficiency to factory performance	12.106
The path of operational efficiency to the relationship of productivity	6.686
The productivity path is related to factory performance	0.715

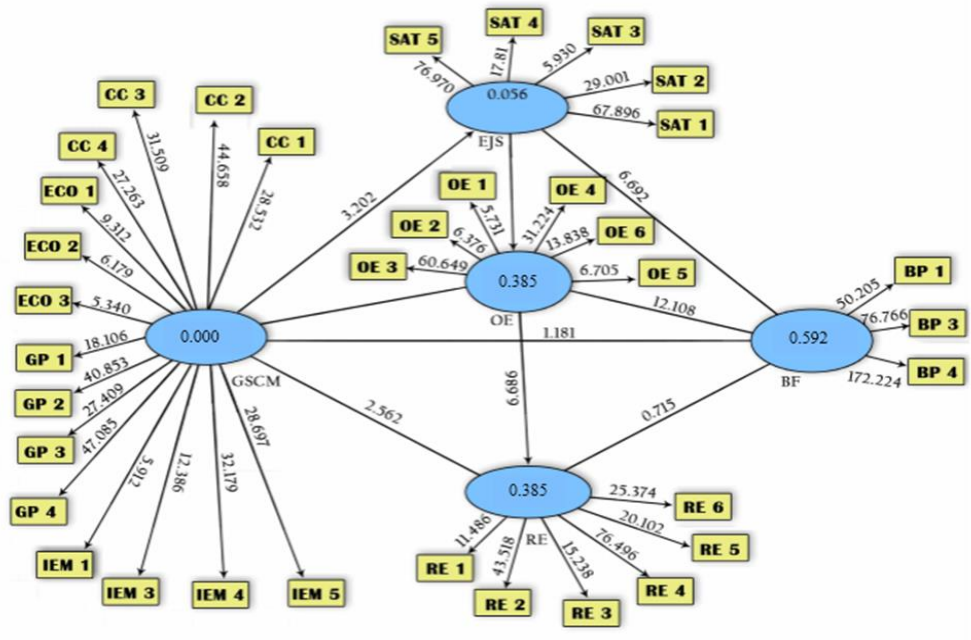

Figure 11. The plotted model for Z coefficients

The second criterion for examining the fit of a structural model in a research is the R^2 coefficients associated with the hidden (dependent) variables of the model. The value of R^2 is a criterion that indicates the effect of an exogenous variable on an intrinsic variable, and three values of 0.19, 0.33 and 0. 67 are considered as the criterion value for weak, moderate and strong R^2 values. According to the results of this study, which is presented in Table 6, R^2 values are related to the operational productivity variables and factory performance greater than 0.33, for the productivity coefficient more than 0.19 and for the satisfaction variable The staff is less than 0.19, which in total the values of R^2 represent the fitting fit of the structural model. The Q^2 criterion specifies the predictive power of the analytic models, and if the value for an intrinsic factor of three is 0.02, 0.015 and 0.35, then the predictive power of weak, moderate and Strong or extraneous to it. As Table 7 shows, the Q^2 value for a factory performance greater than 0.35 (strong predictive power) is related to the operating efficiency construct above 0.15 (average predictive power) and Related to employee satisfaction and relational productivity of more than 0.02 (weak predictive power), which in total Q^2 values indicates fit for the structural model. To examine the fit of a general model that controls both the measurement and structural model, the GoF benchmark is calculated as follows:

$$Gof = \sqrt{\text{Communalities} \times R^2} \qquad (1)$$

The average of shared values of the average values of the hidden variables of green supply chain management dimensions, personnel satisfaction, operational productivity, relationship productivity, and factory performance are obtained. As a result, the average of the shared values is equal to 0.644. To calculate the values of R^2 must also be considered for all the hidden intrinsic variables of the model, ranging from the first and second order, and their average values are computed. The values of R^2 variables are given in Table 8. Therefore, the average of these values is 0.311, and as a result, the GoF benchmark value here is equal to 0.545. Given the three values of 0.01, 0.25, and 0.36 as weak, moderate and strong values for GoF and the achievement of 0.445 for GoF indicates a robust overall model fit.

Table 6 Calculated values for R^2

Factoral Parameters	R^2
Green Supply Chain Management	0.056
Personnel Satisfaction	0.385
Operational efficiency	0.210
Relative productivity	0.592
Factory performance	0.357

Table 7 Calculated values for Q^2

Factorial Parameters	Q^2
Green Supply Chain Management	0.025
Personnel Satisfaction	0.167
Operational efficiency	0.140
Relative productivity	0.496
Factory performance	0.327

Table 8 The shared values of the first-order hidden variables

Factorial Parameters	Shared values
Green Supply Chain Management	0.573
Personnel Satisfaction	0.643
Operational efficiency	0.525
Relative productivity	0.681
Factory performance	0.899

4. Hypothesis test

After considering the fitting of measurement models, the structural model and general model, according to the data analysis algorithm in the EQS software, the researcher is allowed to investigate and test his research hypotheses and to reach the findings of the research. . In this regard, in this research, three basic hypotheses have been designed and implemented for the management of green human resources. These assumptions are as follows:

- *Hypothesis 1*: Green Human Resource Management affects the business performance of the compost recycling plant.
- *Hypothesis 2*: Green Human Resource Management influences the staff satisfaction of the compost recycling plant.
- *Hypothesis 3*: Green Human Resource Management influences the productivity of the compost recycling plant.

These assumptions are evaluated by the software and the hypothesis test results are presented in Table 9.

Table 9 Test the hypotheses proposed for this research

Hypothesis	Path coefficient	t-value	Results
1	0.05	1.981	O.K.
2	0.237	3.202	O.K.
3	0.483	9.735	O.K.

5. Conclusion

Green Management Communication with Green Chain Management Professionals - Organizational consultants and policy makers from the Cleaner Industry can combine human and organizational aspects with the implementation of green supply chain management, and also shows that How can the framework be used and the concepts for teaching green supply management and green resource management are central issues in areas / issues related to organizational sustainability. This study could help researchers better understand the constraints on these issues and the possibility of integrating them into sustained supply chains. These research areas require the development of innovative ways to think. In other words, the fear of failure to capture the green supply chain in order to lose the competitive advantage of the organization, the reluctance of the industry to take effective environmental measures, the problem of turning the positive environmental perception into practice (the distance between the letter and the act), lack of expertise Technical and alternative design for products that meet environmental requirements, design complexity for reuse / recycling of products used, design complexity to reduce resource / energy consumption Organizations currently lack the flexibility to make new changes to the system, lack of access The organization is dedicated to the technology, process and materials suitable for the acceptance of the chain Green supply. Obviously, for the organization to become green, it needs to upgrade the technology.

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