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REVIEW OF THE LITERATURE ON THE SENSITIVITY FACTORS TO THE GSCM (GREEN SUPPLY CHAIN MANAGEMENT) ADOPTION

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Abstract: In recent years, logistics have shown a real interest in greenhouse gas emissions. In Morocco, several actions and practices have been undertaken within the framework of environmental management of the supply chain. But the percentage of companies engaged in reducing the environmental impact of these logistics activities is very low compared to the total number of companies in Morocco. This work is a review of the literature on green supply chain management (GSCM). We present a conceptual framework in which we have proposed hypotheses on the sensitivity factors of the GSCM approach implementation that will be verified in a future empirical study. We have previously determined several classifications of sensitivity factors, a classification among those proposals has been chosen, and the collection was completed by adding another category to complete the collection. A definition of this approach was established from a series of definitions provided by existing literature which helped us define our operational definition which will be used in all subsequent studies.

Keywords: Green supply chain management, sustainable development, sensitivity factors, regulation, Moroccan charter of green logistics.
Abbreviations: Green Supply Chain Management (GSCM), Green Scientific Publication Pressures (GSPP), Environmental Issues Consideration (EIC).

Introduction

In the coming years, environmental problems are one of the major challenges facing our society. They are always present in world debates, and everything shows the role of companies with regard to this subject. Indeed, industries in general are the largest emitter of greenhouse gases. In Morocco, carbon figures in the last ten years have confirmed the need to mobilize all stakeholders to meet this challenge. The Supply Chain is increasingly witnessing interventions aimed at reducing environmental impacts by greening its strategy. This gave us a new approach: GSCM.

There is a lack of data on the GSCM approach in Morocco, which may affect a company's green orientation. Moreover, the limited number of Moroccan publications on the topic of GSCM does not focus on this approach per se but rather treats it in conjunction with other approaches, such as the Lean approach, resilience, and big data (Cherrafi *et al*., 2018; Belhadi *et al*., 2021 Touriki *et al*., 2021; Bag *et al.*, 2022). Companies consulting and research centres rarely achieve their research objectives on this topic, due to the lack of online information on Moroccan green companies, especially with the absence of detailed methodology in the published annual activity reports by companies that have successfully adopted this approach. This is understandable when talking about their competitive edge. This document hoped to increase the number of articles published by Moroccan researchers on this subject, by encouraging decision-makers to focus more on environmental issues. To fulfil the study parameters, the following research methodology was used: in the first section, an operational definition of the GSCM approach was proposed by analysing the definitions of the two approaches (GSCM and SSCM (Sustainable Supply Chain Management)) in the context of sustainable development. Withal, influencing, or sensitivities factors are discussed in the sub-section by presenting a series of their

classifications according to the study context. A classification was selected from among the proposals, because of its simplicity and its ease of understanding, but it missed the factors of management and strategy. To rectify this lack, a new category was added to this assembly which was called the Managerial Factor. The study proposed several hypotheses by analysing the literature on ten sensitivity factors in the following four categories:

- Contextual factors: Sector of activity, regulations, the GSPP (Green Scientific Publications Pressures)
- Organisational factors: Company size, age, age of EIC (Environmental Issues Consideration)
- Individual factors: Employee training (level), human behaviour, and education
- Managerial factors: Top management, the commitment of the general management of the company

In the second section, hypotheses based on an extensive literature review on the relationship between susceptibility factors and the adoption of GSCM practices were explored. It was determined that moderating factors of this relationship was among the ten sensitivity factors which were: The age of the company, size, and sector of activity. The last section presents a discussion of the research results, in which the conceptual framework is present to define the two main hypotheses on three types of variables: Dependent, independent, and moderate variables.

Study Context

GSCM

The supply chain ceases to be a secondary activity or function and becomes an integrative and collaborative approach that follows the company's strategy. Faced with this progress, innovation in this area has become a primary necessity to increase performance. This innovation can be done by introducing new approaches to supply chain strategies. Today, the modernization of the supply chain is being done by integrating the ecological spirit into its strategy. This integration has created an ecological approach; the Green Supply Chain Management, which is a theme, based generally on Sustainable Development.

From its first appearance till today, the concept of GSCM has on taken several definitions. (Srivastava, 2007b) showed in his article that '*the integration of environmental thinking into logistics chain management, including product design, materials supply, selection of manufacturing processes, delivery of the final product to consumers, and product management after its end of useful life*'.

The supply chain observatory (2008) defines Green Supply Chain Management (GSCM) '*as a supply chain aimed at minimizing the environmental footprints of a product or service throughout its life cycle. It mainly concerns the environmental dimension of sustainable development in this case eco-design, eco sourcing eco-manufacturing, eco-logistics and reverses logistics'* (Chatin *et al*., 2008). This definition is the most used by researchers and experts in this field. It emphasizes the economic and environmental dimensions of sustainable development. The same dimensions are also mentioned in the definitions of GSCM found in the following references (Zhu *et al*., 2005; Yeh & Chuang, 2011; Büyüközkan & Çifçi, 2012; Sharma *et al*., 2017). However, references by (Kumar *et al*., 2012; Morana, 2014; Chin *et al*., 2015; Kammas, 2017) has a different perspective on the definition of GSCMs, as they based their definitions on the social and environmental dimensions of sustainable development. There are also other definitions, based solely on the environmental drivers of sustainable development such as (R. B. Handfield *et al*., 1997; Srivastava, 2007a; H'Mida & Lakhal, 2007; Albino *et al*., 2009; Sarkis *et al*., 2011; Wee *et al*., 2011; Gavronski *et al*., 2011).

Given the ambiguity surrounding the definition of GSCM, and the overlap that exists between the definitions of GSCM and many other

definitions has similar terms, especially with the definitions of SSCM (Sustainable Supply Chain Management). Complications often arise when trying to apply the principles of greening to this area. In this context, the previous studies by the authors aimed to clarify the relationship between the Sustainable Development Goals and the principles of the two approaches (GSCM and SSCM) (Souhli *et al*., 2018). It was found in this study :

- GSCM directly targets economic and environmental performance. While SSCM covers all the pillars of Sustainable Development (SD) (social, environmental, and economic). In light of these results, it was concluded that GSCM is a strategic approach which focused on improving the environmental dimension of sustainability and also on the creation of value at the economic level.
- The social pillar and CSR are two differentiating criteria between GSCM and SSCM.
- SSCM is an extension of GSCM as it covers all the characteristics of SD

The previous research resulted in a new definition of GSCM '*Green Supply Chain is a logistics chain aimed at minimizing the ecological footprints of a product or a service. Service, throughout its life cycle, concerns the environmental and economic aspects of sustainable development. All these activities must ensure a symmetrical relationship (win/win) between the two components*'.

Figure 1 illustrates the proposed model for green supply chain management. It does not contradict the definition most commonly used by peers (definition adopted by the Green Sector Observatory 2008 2nd edition), but it adds symmetry between the two components of sustainable development: i.e., the economic component and the environmental component. This symmetrical character is defined by the profit/profit aspect or the double profit, i.e., the green action carried out within the framework of the GSCM approach must be an action that also allows an economic profit, and the converse must be true.

GSCM factors

Several researchers and field experts have discussed the factors of GSCM in their work, and in Table 1 we have categorized these suggested factors according to the context of their studies, the list of suggested factors is indicative rather than exhaustive.

(Labelle & St-Pierre, 2010) suggested grouping of variables by distinguishing between contextual, organizational, and individual factors. This grouping of factors is in the wake of a founding text on CSR, by (Wood, 1991). The classification of the determinants of CSR according to these three plans was taken up in the work of (Lepoutre & Heene, 2006)-(Blombäck & Wigren, 2009). According to a three-level analysis grid, (Labelle & St-Pierre, 2010) considered contextual factors as external factors that exert a tangible influence on the motivation of companies and their leaders

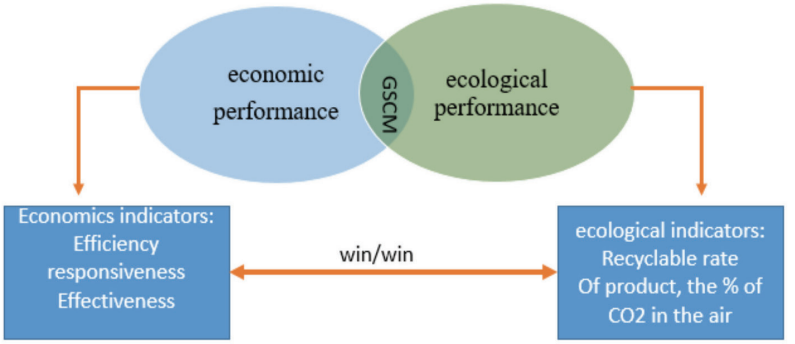

Figure 1: The pillars of Green Supply Chain Management (GSCM)(Souhli *et al.,* 2018)

to consider SD issues. Organizational factors, according to the authors, present determinants that establish the ability of companies to adopt SD practices. Finally, the personal determinants act on the intentions of the leader vis-à-vis the expectations addressed to them to maintain the legitimacy of the company (individual factors).

This classification is made for the general approach of DD that is to say for SSCM, however it can also be used for the approach which targets the environment that is to say GSCM. The authors added another type of sensitivity factor that they called Managerial Factors (MF), to which they studied the influence of the top management and the commitment of the top management to GSCM practice adoption. The proposed definition will therefore have four types of sensitivity factors: Contextual Factors (CF), Organizational Factors (OF), Individual Factors (IF), and Managerial Factors (MF).

Potential Determinants of Sensitivity Factors to GSCM Adoption

Introduction

Table 1: Factors of GSCM

Year	*Authors*	*Type*	*Types Factors*	*Examples/Action/Definition/Variable/ Determinants*
2018	(Wannaruk & Nakkiew, 2018)	Factors Affecting Green Supply Chain Management	Green design	Act: The use of environmentally friendly raw materials.
			Green purchasing	Act: Quality Inspection of Raw Materials
			Green Manufacturing	Act: Toxins control in the production process
			Green logistics	Act: The delivery routes are determined.
			Reverse logistics	Act: The wastewater treatment.
2018	(Tlaty, 2018)	The independent variables of the theoretical model	Green purchase	Act: Reducing sources of waste, recycling,
			Eco conception	Def: '*actions taken during the product development phase aimed at minimizing the environmental impact of a product throughout its life cycle, and ultimately at its final disposal without compromising other essential product criteria such as performance and the cost*'. (Younis *et al*., 2016)la première du genre au Moyen-Orient, a développé un modèle de recherche pour tester la relation entre quatre principales pratiques GSCM à savoir, l'éco-conception, les achats écologiques, la coopération environnementale et la logistique inverse, et quatre dimensions de la CP : la performance opérationnelle, la performance environnementale, la performance économique et la performance sociale, tout en contrôlant trois variables principales (taille de l'entreprise, âge de l'entreprise et certification du système de management environnemental

			Environmental cooperation	Ex: In the manufacturing industry, cooperation to achieve environmental objectives must exist between the different departments of an organization such as purchasing, marketing, production, and human resources.
			Reverse logistics	Def: '*return or take back of products and materials from the point of consumption to the supply chain for recycling, reuse, reclamation, repair, reclamation or safe disposal of products and materials*' (Carter & Ellram, 1998)
2012	(Kim & Rhee, 2012)	critical success factors	Partnership	Var: Linkage with partners
			Information Technology	Var: Based technology; RFID/USN, POS, EDI
			Standardization and Integration	Var: Linking networks of the IT for supply chain
			Supporting Organisation	Var: Organisational structure of linked supply chain
			Strategy	Var: Business understanding of SCM in the supply chain
			Process	Var: Cooperation for process innovation
			Performance	Var: Suggesting performance for process level
2015	(Agi, 2015)	Organizational and Inter-Organisational Factors Influencing GSCM Implementation	Organizational	Var: Size of the company Var: Dependence on relationships with customers and suppliers
			Inter-organisational	Var: Engagement de la haute direction Var: Employees empowerment, involvement, and incentives (reward and appraisal system
2017	(Choudhary *et al*., 2017)	Critical factors influencing the management of green supply chain practice	Green design	Act: Life cycle assessment of a product
			Supplier Collaboration	Act: Environmental Partnership
			Customer collaboration	Act: Mutual understanding
			Government regulation	Act: Taxes penalty
			Performance measurement practice	Act: Green auditing
			Top management commitment	Act: Formulating environmental strategy
			Organizational Resources	Act: Financial resources
			Reverse logistics	Act: Location of recovery facilities

2015	(Labelle & St-Pierre1, 2015) sensibility factors	Contextual Factors	Location, internationalization, sector of activity and fungibility of activities, position in the value chain
		Organizational Factors	Size, regulation, shareholding (ownership structure), economic performance, age, capacity for innovation
		Individual factors	Gender, age, training (level), training (specialization), attitude towards profit, the conception of company performance

Despite a large amount of work and research on sustainable development practices within the company or the so-called social responsibility of the company, little is known about the factors that reinforce its commitment to the green management of the supply chain. Morocco is a country that is increasingly engaged in environmental initiatives to fight against the harmful effects of climate change. In this context at the 22nd Session of the Conference of the Parties **(**COP22), the Moroccan logistics community mobilised more around this subject as part of a voluntary process. This approach is an information tool on the principles and good practices of green logistics, therefore is a permanent invitation to various entities to adopt these practices. It also presents a list of charter members which consists of more than 50 companies.

Organizational Factors

H_1: The age of the company influences the adoption of GSCM practices.

There are many past studies in which the authors considered the age of the firm as a controlling or moderate variable, and they studied this phenomena with subgroups to know the effect of this controlling variable on the direction and intensity of the studied relationship. (Cassells & Lewis, 2011) also considered the firm's age as a control variable for the relationship between the adoption of environmental practices and the attitudes toward the firm and the environment. (Younis & Sundarakani, 2019) explored the impact of the control variable's age, size of the company, and the possession of an EMS environmental management certification on the relationship between the adoption of GSCM practices and the different performance dimensions of the company. They found, through a comprehensive analysis of 117 responses to the questionnaires distributed to companies in the United Arab Emirates, that the size and ownership of the EMS certificate had a positive effect on the environmental performance, economic performance, and the social performance, but not on the operational performance, while the age of the company is not linked to any of the four performances.

We used the Moroccan Green charter to extract hypotheses on GSCM in Morocco, by analysing the profile of the Green Charter affiliates according to the factors for which information is available, allowed the authors to extract hypotheses according to three factors: Size, sector of activity, and age of the company. Companies often present on their websites all the information necessary for this research. However, some companies do not have a website, or it did not contain the information needed. Therefore, we are obliged to use the state's platforms that are public and contain all the information on the organizational factors of companies i.e., size, sector of activity, age, economic performance.

From the Moroccan Green Charter, we classified companies according to three periods, considering that old companies are the ones that were created before 2000 and new companies are those that were created after 2010. Before discussing the results, the authors believed that young companies have a conscious perception

of the challenges of sustainable development, which lead them to say that older companies will maintain their strategy to ensure the usual economic balance of the company. Cabagnols & Bas (2008) noted that younger companies should be more receptive to SD and CSR (Corporate Social Responsibility) than older ones since these issues are eminently contemporary. CSR is a practice of the 3 SD issues: Environmental, social, and economic.

According to Figure 2 Companies that were created before 2000, present 68 percent of companies that adhered to the Moroccan charter for the Green Supply Chain, while new companies that were created between 2010 and 2014, there were only a small percentage of them that adhered to the charter. This means that environmental issues primarily affect older companies. These results pushed us to explore that older company have a rich strategy of experience, which makes them inventive and thus more competitive, especially in respect to environmental issues. They certainly have a specific educational ethics to deal with economic shocks and challenges when applying a new approach.

H_2: The size of the company influences the adoption of GSCM practices as a moderating factor.

The size of the company is certainly one of the most often mentioned organizational determinants (Labelle & St-Pierre, 2010). Cassells & Lewis (2011) moderated the relationship between environmental practices adoption and attitudes toward the firm and the environment, by the firm's size, age, and age/gender of the owner-manager of the SME. They found large SMEs are more capable of solving strategic problems like environmental management. Larger SMEs would perceive, better than micro and small enterprises, the benefits they could obtain from CSR practices, by integrating them into a strategic vision (Brammer *et al*., 2011). Using the green Moroccan charter, we classified companies into three categories (big companies, small and medium companies, and micro-companies). Considered by reference (Celier, 2004), large companies are those with a turnover greater than or equal to 75 million DH, small medium-sized companies had a turnover of less than 75 million DH, while micro companies had a turnover of less than 10 million DH.

The size of the company is not a factor: 80 percent of the companies employing less than 49 people confirmed the importance played in safeguarding the environment for their businesses. This survey of 3,539 professionals from the primary, secondary, and tertiary sectors investigated the way preservation of the environment is managed, the main risk areas, and the initiatives implemented in different sectors (DNV: Det Norske Veritas, 2021).

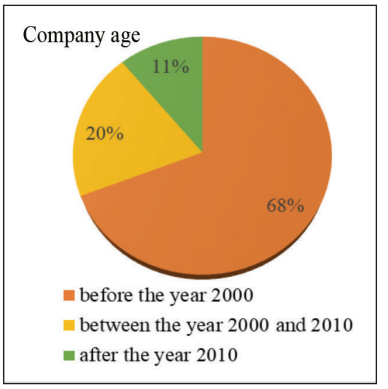

Figure 2: The age of companies committed to the Moroccan Charter for Green Supply Chain

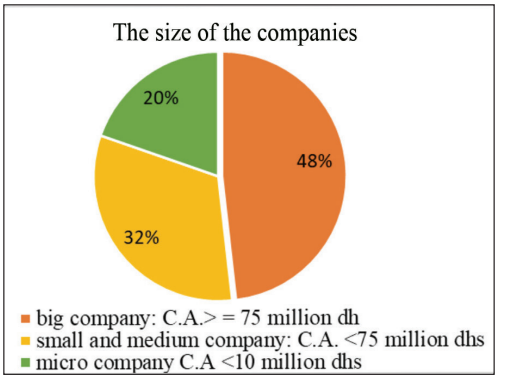

Figure 3: Size of companies adhering to the Moroccan charter of the green logistics chain

We see from Figure 3: That the big companies are the most involved in the Green Supply Chain approach: 48 percent of companies whose turnover exceeded 75 million dirhams integrate environmental issues into the strategic decisions of the supply chain, while this percentage falls to 20 percent for companies, who had a turnover of less than 10 million dirhams. The human and financial resources available can explain this gap in particular. This is obvious because large companies have all the human resources and capacities necessary to adopt new approaches, especially environmental ones, and thus gain a competitive advantage in the market. Therefore, it can be said that respect for the environment in decision-making, especially in the supply chain of companies, depends on the size of the company, and this is shown in Fig.3. Moreover, (Cabagnols & Bas, 2008; Perrini *et al*., 2007) added that large SMEs have more developed sensitivity to Sustainable Development issues than smaller SMEs.

H_3: The decision to consider GSCM approach depends on the age of the EIC or (the presence of EMS: Environmental Management System).

EIC can translate to EMS certification, ISO 14001, or any voluntary green initiative, whether certified or not. From a literature search, it was found that several authors had studied the impact of obtaining an EMS (or an ISO 14001 certification or any other green initiative) on the adoption of GSCM practices. González *et al*. (2008) analysed the relationship between the possession of a certified EMS (ISO 14001 or EMS) and the size of the organization as an independent variable and the demand made to suppliers to implement environmental practices (as a dependent variable). Through the method of logistic regression to evaluate the relationship, the author found that there is a significant relationship between these two variables. The author used a survey questionnaire to conduct individual interviews with 157 automotive industry executives in Spain. The results indicated that the implementation of GSCM is represented by having an EMS certification such as ISO 14001, this directs the environmental behaviour of the company towards the surrounding stakeholders, including its suppliers. Furthermore, (Darnall *et al*., 2008) found in their empirical research that organizations adopting EMS more frequently implement GSCM practices, regardless of the duration of the EMS implementation. They add that EMS adopters have a greater likelihood of improving the environment not only within their organizational boundaries but across their network of buyers and suppliers. These results suggest that SMEs and GSCMs can therefore complement each other to improve environmental performance.

The decision to consider the GSCM approach depends on the duration of existence or the seniority of the first action of any environmental approach in general. Obtaining an environmental certificate or obtaining an environmental management system (EMS) can take years depending on the companies' maturity in dealing with changes in its internal working climate and many other factors, this means that certified companies ISO 14001 only practice environmental considerations after obtaining the certificate but they apply to several stages and after a series of examinations at several levels (*AFAQ 14001 par étapes - AFNOR Certification*, s. d.). Therefore, the age of EIC is directly linked with the existence, or the process of EMS implementation in the company.

H_4: Firm size is a moderating factor in the relationship between the age of EIC and the adoption of GSCM practices.

After extensive research, the authors found a single work that exposed the relationship between the age of the EIC and the adoption of GSCM practices in companies. According to Chatin *et al*. (2008), the age of environmental consideration varies considerably from company to company and from country to country. 36 percent of companies surveyed had taken this dimension into account for more than five years and nearly 40 percent for less than three years. This survey is conducted internationally. Japan, for example, is an exception, where 85

percent of companies had taken environmental issues into account for more than five years, far ahead the rest of the world. According to the authors, part of the differences between Japan and the rest of the world can be explained by the very high proportion of very large companies. They pointed out that a company's size must be considered to validate the trends presented or the validity of the relationship between influencing factors and the adoption of GSCM practices. From the last citation hypothesis H_8 can be proposed.

Contextual Factors

H_5: The activities sector of the company influences the adoption of GSCM practices as a moderating factor

Many researchers (Nikolaou & Evangelinos, 2010; Luthra *et al.,* 2015; Shen *et al.*, 2015; Sivakumar *et al.*, 2015; Govindan *et al.*, 2016; Muduli *et al.*, 2016; Rueda *et al.*, 2017) have identified the industrial sector in their study, but they have not developed a general model for each sector, that is to say that they are aware that each industrial sector responds to environmental awareness to a different degree from others. They studied the companies' responses to environmental issues in subgroups, each assigning a different industry sector. In the results, they found that each group had a response of different strengths and directions in comparison to the other groups. This means that the sector of activity for these authors is a moderating factor in the relationship between the adoption of GSCM practices and the factors studied in each study.

Xu *et al.* (2013) studied 32 pressure factors on industries to adopt GSCM, this study included six industrial sectors and found that the electrical/electronic industries had lower pressure than the automotive or chemical sectors. They stressed that the environmental development of a nation does not depend on a single industry but on different industrial sectors. This study illustrates the differences of the impact of pressure between different sectors and different production measures in Indian manufacturing companies to implement GSCM. It also identifies which sectors have less awareness and less pressure.

Using the Moroccan green charter, the authors found that only six activities of sectors were on the list of adherents of the Green Supply Chain Charter membership list. This is due to the very limited number of companies participating in this Charter. Figure 4 indicates that transport/ coordination is the most mobilized sector of activity in the Moroccan charter for green supply chain. It presents 74 percent of the total companies; it comes after with low percentages: Production/construction, mass consumption, etc.

This is explained by the ease and speed of implementation of these measures. For example,

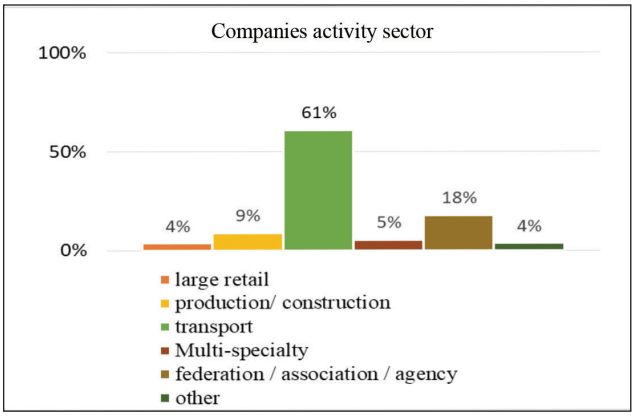

Figure 4: The business sector of companies adhering to the Moroccan charter of Green Supply Chain

environmental activities in the transport sector are easy and quick to set up and do not require a lot of investment (training in drivers' ecological driving, vehicle development, improvement of transport and packaging flows, etc.). Moreover, the transport sector in Morocco is subject to more environmental legislations than other sectors.

H_6: Adoption of GSCM positively or negatively influenced by regulation.

Kammas (2017) presented among several issues the regulations in force as a GSCM implementation issue. (Abdallah *et al.*, 2012), government regulation and support can encourage or discourage the practice of GSCM in SMEs depending on the robustness of the system. Besides that, Jayal *et al.* (2010) presented environmental regulations as one of several reasons for achieving the global sustainability of industrial activities. Moreover, Mathiyazhagan & Haq (2013) identified 'central government environmental regulations' and 'regional environmental regulations' among the 25 factors that drive companies to implement GSCM. The identification of these factors was based on a review of previous literature. The ISM methodology used in this study showed that these two factors occupy the lower part of the hierarchical structure and are among the most important ones. Choudhary *et al.* (2017) considers that regulation is a key factor which starts the whole process of activating the environmental impact consideration in a company, it has an impact on the organizational resources and capacities, as well as on the commitment of the senior managers in the practice of the green supply chain. They influence the collaboration of suppliers and customers who in turn help to manage the operational aspects of Green Supply Chain Practices such as green design, reverse logistics, and performance measurement practice. In another study, fifteen drivers for the adoption of GSCM practices were explored through a literature review of the Indian manufacturing industry, the authors used the ISM method to discover the interdependence between these factors, and the study identified environmental regulations as being among the most important engines (Mudgal *et al*., 2009). In the same geographic context, a literature review and industry expert consultation on a manufacturing company in India, Diabat & Govindan (2011) explored eleven drivers of GSCM adoption. In this study, 'environmental regulations and legislation were found to be the most important drivers'. Withal, 32 pressures are identified from extensive literature reviews and they were categorized into five distinct groups based on their similarities. Analysis of the statistical data from a one-way analysis of variance (ANOVA) survey, followed by a pairwise comparison of means using Tukey's test showed that the most significant factor was found in the 'Government policies and regulations' category (Xu *et al*., 2013).

According to Green *et al*. (1996), Mangla *et al*. (2014), Walker *et al*. (2008) and, Zhu and Sarkis (2006), Central government, as well as state government policies and schemes, are proven to be one of the major factors for organizations to start up their green initiatives.

In the Indian state, companies are under great pressure from government regulations and from foreign customers who are forcing them to adopt green practices in their activities (Sivakumar *et al*., 2015). The regulatory factor is not an incentive for Moroccan companies, and the green organization approach always takes on a voluntary nature. In this context, a Moroccan researcher compared Moroccan and French environmental legislation in 2016 and found that the Moroccan legal arsenal should be strengthened in environmental matters. It particularly emphasized the phase of construction, transport, building management etc. (Bouroubat, 2016).

H_7: The activities sector of companies' moderate relation between regulation and GSCM practices adoption.

The diagnosis of the current situation of national taxation, towards its ability to modify the behaviour of economic agents in favour of the preservation of the environment,

made it possible to draw up a data matrix of taxes, taxes, and royalties in Morocco. The analysis highlighted that the national tax system has a budgetary purpose and only four taxes and charges partially have a behavioral orientation objective aimed at protecting the environment: Tax for vehicles over five years old; Tax on motorcycles; Wastewater treatment charge; Charge on waste (Conseil National de l'Environnement, 2009). It was also noted that two of the four taxes applied to the transport link in the logistics chain, which accepted 50 percent of environmental taxes. This also justifies the results found in the transport sector in the previous Section 1.

H_8: The GSPP positively influences the adoption of GSCM practices

Environmental themes have always occupied a central place in the world of communication, public and private, professional, expert or ordinary, strategic or spontaneous. Information and communication sciences (CIS) have studied these topics since the early 1990s when the emergence and rapid amplification of these terms were observed (Catellani *et al*., 2019). The role of publications is to produce spaces where communities capable of conversing and exchanging on scientific subjects can be formed (Vitali-Rosati, 2018). Environmental publications guide ones understanding of green topics the way the authors intended. These environmental contacts play an implicit role in engaging individuals, organizations, and even nations in green issues.

According to Meisner (2015), environmental communication fulfils two main social functions: The first is communication, a practical, even indispensable, action tool to inform, persuade, educate and alert others. Likewise, we use communication to organize, discuss, reconcile and negotiate with others. The second major social function of communication is that it plays an important role in the creation of meaning. Communication shapes how we see and appreciate the world of things, events, conditions, ideas, etc.

To know the relationship between the level of adoption of an approach in a country and the level of maturity of scientific research of the approach, two variables were defined: The first is the percentage of companies participating in the GSCM process and the second is the number of articles published on this topic. The authors worked on four regions because they previously had studied the percentage of companies that adopted the GSCM approach in 2008 in these regions, so they needed to consider the number of articles published while leaving enough time for companies and stakeholders so they can decide on the greening of its supply chain.

Therefore, we considered the number for seven years before 2008, they then searched in the direct scientific literature platforms using the phrase 'Green Supply Chain', the number of articles published by eight universities that were considered the first in the national ranking at the time were taken into consideration. In the author affiliation box, they selected universities like, 'Harvard', which is located in the united states, determined the years between '2000-2007' and recorded the results issued. They continued to inventory the results for the remaining seven universities in the United States. They ended the search with the same approach for the other three countries

In Figure 5 Japan announced the participation of all its companies in GSCM in 2008, and in return, the greatest number of articles were published between 2000 and 2007, while in France, the percentage of its companies adopting an environmental approach at the level of its logistics chains were weak as compared to other countries, it was also noted that low scientific inquiries were made on this subject. The lowest percentage was seen in the United States despite the large number of articles published. This is explained by the change in strategy of political decision-makers on the theme of environment, in 2001 the United States, along with other countries, decided to withdraw from the Kyoto protocol for the reduction of greenhouse effect emissions. Figure 5 indicates that the proportion of companies participating

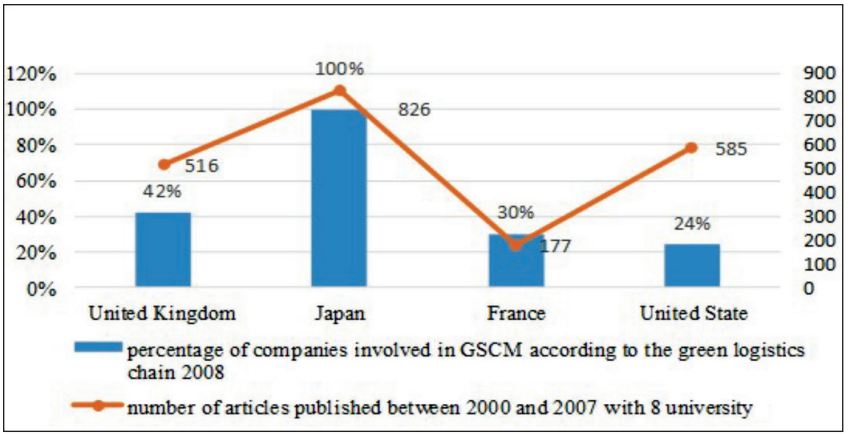

Figure 5: The percentage of companies participating in the GSCM process and the number of articles published on this topic

in GSCM increased with the augmentation in the number of articles already published on the same subject, and vice versa as well. This means that the GSPP variable influences the adoption of GSCM practices. There is an outlier that does not follow the suggested trend, and this can be attributed to the US. Although the number of publications is large in this country, it does not affect the orientation of companies towards green practices, due to the change in the attitude of the United States towards respect for the environment. Which manifested itself through its withdrawal from the Kyoto Protocol in 2001, and became the only industrialized country not to have ratified the Kyoto Protocol.

Individual Factors

H_9: Employee training and education positively influences the adoption of GSCM practices

Education and training are other sub-factors that provide employees with the necessary understanding and knowledge to achieve personal and global goals set by the company, provided they are carried out in a consistent, transparent, timely manner with real-time updates to form a solid and continuous basis of tracking (James, 1996). To analyse the relationship between green training and green supply chains, (Teixeira *et al*., 2016) such as green purchasing and cooperation with customers, presents several challenges, often due to a lack of green training. In order to analyze the relationship between green training and green supply chains, a survey of Brazilian firms with ISO 14001 certification was conducted. The main characteristics of green training in the sample were also explored. The results indicated that green training is positively correlated with the adoption of green supply chain practices in green purchasing and cooperation with customers, confirming the study's main hypothesis. The research results also indicated that green training tends to help firms improve their green supply chain management to cooperate with customers and implement green purchasing. This work extends the current literature by showing that employees' green training content and requirements for greening suppliers should be further aligned. This alignment should also involve cleaner production priorities built up through customer cooperation. As a consequence, firms will reach internal environmental targets and achieve external environmental improvements (such as through having greener suppliers surveyed Brazilian ISO 14001-certified companies with a 28.78 percentage response rate. The results indicated that green training is positively correlated with the adoption of green supply chain practices in green purchasing and cooperation with customers. This positive relationship means that green training helps companies improve their green supply chain

management to ensure cooperation with their customers and implement green purchasing. In addition, among seven remarks on practical experiences of greening production that have been carried out in more than thirty Hungarian companies, we noted 'employee motivation' is a factor that facilitates the adoption of cleaner production. Zilahy (2004) found in their work that the success of the implementation of the GSCM is attributed to employees, an employee trained on environmental issues in companies is not like an employee who does not have ecological precociousness. This kind of training and education of employees helps to avoid their resistance to change to the usual actions of companies' processes. Through a literature review, Wee & Quazi (2005) identified 64 elements under seven critical success factors for EMS implementation in electrical and chemical companies in Singapore. Their study was based on a survey questionnaire and the response rate was 21.9 percent. They evaluated the reliability and validity of these factors through statistical analysis. The result of their study showed that finally 62 items were extracted under seven critical factors, among which one was able to find the total employee engagement factor.

H_{10}: Employee human behaviour positively influences the adoption of GSCM practices

Muduli *et al.* (2013) considers that the GSCM implementation in mining industries depends largely upon certain factors which are influenced by human behaviour (experience, communication, Employee empowerment etc.). The behaviour and thoughts of people reflect the shared culture of the organization. First of all, the existing organizational culture will affect cleaner production implementation unconsciously and in a taken-for-granted fashion. It is thus necessary to understand what the existing culture is and how it affects the cleaner production implementation program (Tseng *et al*., 2009).

Moreover Mharzi (2016) revealed in his empirical studies that the main motivations for integrating environmental concerns vary according to the status of the respondent. On the other hand, using the DEMATEL method to rank factors affecting the implementation of GSCM practices, Govindan *et al.* (2016) found the method of ranking factors according to the strength of their influence that 'worker pressure' was the least important of the 20 factors identified from the literature review.

Managerial Factors

H_{11}: Adoption of GSCM practices positively influenced by top management

According to Govindan *et al.* (2014), the top management takes the responsibility of preparing the environmental policy of an organization and developing the GSCM implementation plan. The 'top management realization' variable, categorized as the driver of the group of effects, cannot be ignored. This variable turned out to be the most influential factor, according to the analysis of priority weights. Therefore, according to the authors, the top management should maximize their level of involvement in GSCM activities to achieve better performance. Gandhi *et al.* (2015) finds from a study on the success factors of GSCM adoption that top management is one of three factors that obtained the highest influential power for accomplishing successful GSCM adoption. Moreover, Hoejmose *et al*. (2012) talked about top management support, he they considered that GSCM is influenced by trust and top management support, and therefore they view GSCM through the conceptual lens of trust. Muduli *et al.* (2020) conducted an empirical study on the behavioural factors affecting the performance of GSCM, the percentage of responses in this study was 25.25 percent, they pointed out through the causal link study between these factors that the support of the top management and green motivation is the most crucial behavioural factors influencing GSCM performance. Further, Hu & Hsu (2010) developed based on the literature and interviews with three industry experts, specifically quality and product assurance representatives. A total of 300 questionnaires were mailed out, and 87 were returned, of which 84 were valid,

representing a response rate of 28 percent. Using the data collected, the identified critical factors were performed via factor analysis to establish reliability and validity. Findings: The results show that 20 critical factors were extracted into four dimensions, which denominated supplier management, product recycling, organization involvement and life cycle management. Research limitations/implications: This study obtained 84 valid responses from the Taiwanese electrical and electronics industries, the limitation of the study is the insufficient sampling. Future researches need to be performed using a larger sample and studying more countries. Practical implications – The Taiwanese electrical and electronics industry plays a decisive role in the global information and communications technology (ICT conducted a questionnaire survey the critical factors for implementing GSCM practices in Taiwan's electrical industries, the study found that 20 critical factors were categorised into four main dimensions, called supplier management, product recycling, organizational involvement, and life cycle management. The method of factor analyses showed that the first three factors named are the most important.

According to Tseng *et al.* (2009), the new strategy of companies requires top management leadership and commitment, to promote the participation of its employees. Y. S. Wee & Quazi (2005), Wulandari *et al.*, (2012), Zutshi & Sohal (2004) confirm the development of green work culture in any organization is highly dependent on leadership commitment and support. It encourages teamwork and greater employee involvement in greening efforts. Withal, top management is required as they are responsible for the arrangement of resources and their allocation (Shen *et al.*, 2015). In addition, the senior management, after making its positive decision toward the GSCM, subsequently decides to adopt the type of environmental education and training program required to develop its human resources. They also decide on the type and timing of environmental awareness programs (Muduli & Barve, 2015).

H_{12}: Adoption of GSCM practices positively influenced by the commitment of senior management

The commitment of the company's senior management toward the implementation of GSCM practices, according to (Bowen *et al*., 2001; Pujari *et al*., 2004; Pagell & Wu, 2009; Hoejmose *et al.,* 2012; Dai *et al.*, 2014) allows the resources necessary for green initiatives to be made available. In addition, the commitment of senior management also helps to obtain the commitment of employees toward the environmental aspects of their activities, and to encourage the development of an environmental culture and attitude in the company (Zhu *et al*., 2005; Handfield *et al*., 2005; Holt & Ghobadian, 2009; Hoejmose *et al*., 2012; Dubey *et al*., 2018). Moreover, Govindan *et al.* (2016) identified the drivers of GSCM for which they have specified the causal relationship between them through the use of the Laboratory for Decision Support, Testing, and Evaluation (DEMATEL). In addition, the results of the study on the hierarchy of factors according to the strength of their influence explored that 'senior management commitment' is one of the two most important driving factors. Furthermore, senior management commitment has been identified in the above research as one of two drivers for adopting GSCM practices. On the other hand, Mudgal *et al.,* (2010) Luthra (2011), Govindan *et al.*, (2014), Mathiyazhagan *et al.,* (2014) found that lack of senior management commitment is a barrier to the adoption of GSCM practices.

Discussion

Through the review of the extensive literature conducted there were four categories of companies' sensitivity to the adoption of GSCM practices identified, several hypotheses were proposed on the relationship between the sub-factors of the four categories and the adoption of the practices of GSCM, a model was then determined that showed these assumptions would be used in future research by creating a model of the structural equations to be verified by the appropriate techniques and methods.

Having different strength relationships between two variables even lead to contradictory results (positive relationships in some studies and negative in others or no relationship in some studies). This kind of phenomenon typically indicates the probable existence of a moderating process (Caceres & Vanhamme, 2003). A moderator is a variable that affects the direction or intensity of the relationship between the independent variable and the dependent variable (Rascle & Irachabal, 2001). The size, age, and activities sector of the company were considered as moderating factors of the relationship between the rest of the sensitivity factors and GSCM practices adoption. That is to say that to measure the relationship between the sensitivity factors and GSCM practices adoption needs to consider the control variable (age, size, and activities sector company), the independent variables are the age of EIC, regulation, the GSPP, training, and education of employee, human behaviour of the employee, top management, commitment of top management. While the dependant variable is GSCM practices adoption. Although only two moderated relationships in the literature review were identified, which are presented in hypotheses H_4 and H_7, the influence of moderated variables was incorporated in the authors conceptual framework on all the relationships proposed in H_3, H_6, H_8, H_9, H_{10}, H_{11}, and H_{12}. This is due to the observation of the frequent use of the three variables of size, age, and sector of activity throughout the literature as control variables was seen in the majority of GSCM studies. This means that they can also be control variables in the relationship between influencing variables and the adoption of GSCM practices. In Figure 6 it was proposed that the conceptual frame of this work that have two principal hypotheses to be verified in chain work.

H_a: Adoption of GSCM practices influenced by sensitivity factors

H_b: The relationship between GSCM practices adoption and sensitivity factors is moderated by size, age, and sectors of activity

Implication for Future Research

In a future study, the authors will verify the twelve hypotheses using a questionnaire that will be sent to Moroccan companies of all ages, sizes, and sectors. To confirm the hypothesis H8 which displays the impact of the GSPP on the adoption of the GSCM, the authors will follow the same methodology used to formulate the hypothesis, by looking for the number of publications in the eight years preceding the publication of the survey, they will then do a chi-square test to understand the influence of GSPP on the response of Moroccan companies. The outlier of Figure 5 in the paragraph of hypothesis H_8 indicates the presence of another variable that affects the relationship between the two variables studied, namely GSPP and the adoption of GSCM practices, and this variable will not be that regulation, since the United States has not yet (until 2008) introduced a significant measure to reduce greenhouse gas emissions. It can therefore consider that regulation is a

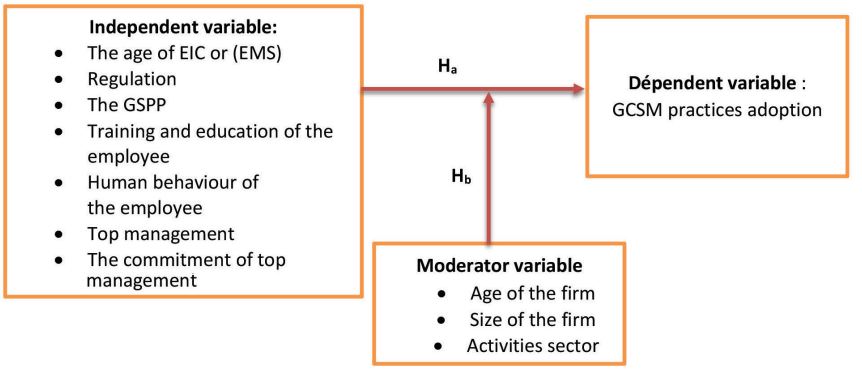

Figure 6: The conceptual framework

moderating variable of the relationship between GSPP and the adoption of the GSCM approach.

In the designed and tested questionnaire, the respondents were asked about the 'respondent's function' as a variable of individual factors, and this variable is similar to the variable considered in the hypotheses which is education, and employee training. The latter cannot be framed due to the large number of training types that may have been included in the responses, which could make the results insignificant. Especially since there are no specified company's sector of activity, which could multiply the types of training possible. Given that the job held by the respondent has been obtained thanks to the training received, the authors have considered that the training and education of the employee variable is a synonym of the function held by the respondent variable. Especially since the study on the second variable will be more significant because the behaviour will be tested of the employee within the framework of his function in the company, this behaviour can be different if one speaks of training apart from the work context, and if it is tested in the last situation, this will consider human behaviour of the employee or his point of view on the green approach far from the context of the company and this will be a personal response. This kind of question was asked the employee's point of view to evaluate his human behaviour towards GSCM, the question was focused on understanding the importance of environmental regulations according to their points of view and because of this question, the influence of the human behaviour variable of the employee on the adoption of GSCM will be assessed. This is because environmental regulations are one of the great motivations for the adoption of GSCM. The reason for choosing the question on environmental regulations instead of directly adopting GSCM is to remove from the mind of the employee the voluntary nature of GSCM and to have clear answers on the degree of importance given to the protection of the environment in general. It is as if the candidate was asked the question 'what do you think about environmental protection?' but instead the motivation of adopting GSCM was used to formulate the question. For the other variables, (age, size, sectors of activity, top management, etc.) the questions were formulated using the direct context of the variable.

Implication for Participants and Researchers

It is noted that many authors talk about the impact of scientific research on the procedures and measures taken by decision makers. In this context, this document is an important source for both researchers and participants. Practical applicators will enrich their knowledge bases in this area, especially since there is a lack of green information that is practiced in Morocco. For researchers, this study will contribute to raising the number of green scientific research in Morocco, and thus with the increase in the number of green publications, we will cross the threshold of informational poverty, which is among the first obstacles to green approaches. The framework discussed in this document is the first step towards further studies, and the definition of the approach is the basis of any start, followed by the identification of the factors affecting the adoption of the approach. After these two steps, which are considered the main component for defining the context of the approach, we can deepen the details of the implementation with a perfect mastery of the primary context.

Conclusion

We represented the result of our work on the definitions of GSCM, for which we proposed an operational definition resulting from a deep analysis of the definitions of GSCM and SSCM. The latter approach being the concept closest to our approach was chosen to remove the ambiguity between the two and to distinguish the GSCM from other concepts. Resulting in a new definition of GSCM: '*The Green Supply Chain is a logistics chain aimed at minimizing the ecological footprints of a product or a product. Service, throughout its life cycle, concerns the environmental and economic aspects of*

sustainable development. All these activities must ensure a symmetrical relationship (win/win) between the two components.'

Our review of the literature presents a series of hypotheses on the sensitivity factors of GSCM approach which allowed us to define our conceptual framework to be verified in future empirical studies. We determined these several classifications of sensitivity factors and we chose the classification of Labelle & St-Pierre (2010). We added to this classification a new category of factors, that we called Managerial Factors. It presents the determinants of top management.

We also found that the number of scientific publications on the subject of the green supply chain over a specified period of seven years (a study we carried out) influences the eighth-year percentage of companies adopting GSCM (Chatin *et al.*, 2008). It is an external factor classified in the category of contextual factors, which presents the pressures of the State and particularly through its scientific entity on the environmental decisions of companies. The 'GSPP' variable represents our influence on decision-makers in the field. This means that we are in the category of stakeholders in this process. We may not be involved in the implementation of GSCM on the ground, but it is clear that our scientific advice has the power to guide decision-makers to action.

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