

**Using Structural Equation Modelling to Assess factors that affect
Reverse Supply Chain Implementation and its Impact on the
Economic and Environmental Performance:
Case of OEMs in the automotive sector in Morocco**

**Utilisation du modèle des équations structurelles pour évaluer les
facteurs qui affectent l'implémentation de la chaîne logistique
inverse et son impact sur la performance économique et
environnementale :
Cas des équipementiers du secteur automobile au Maroc**

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Abstract

A structural equations modelling (SEM) was used to test the impact of five stakeholders and the manager posture's on Reverse logistic (RL) implementation as well as relationships between RL and environmental/economic performance, Moreover, we also used a SEM to study the moderating effects of ISO 14001 certification between RL and environmental performance, as well as the moderating role of company size between RL and economic performances in a sample of 55 OEMs in the automotive sector of Morocco. Results suggest that government importance and RL are negatively linked. In regard to the other determinants of RL implementation, results showed that RL is positively linked to the importance of shareholders, customers, employees and the strategic stance of the manager. However, the importance of local community exercises no influence on the level of implementation of RL. In addition, this study concludes that RL can enhance environmental and economic performance. Moreover, our results showed that with the size of the company, RL increase the level of economic performance, moreover, the interaction between RL and certification is positively related to environmental performance.

Keywords : Reverse supply chain ; implementation ; performance ; environmental ; economic.

Résumé

La méthode des équations structurelles a été utilisée pour tester l'impact de cinq parties prenantes et la posture stratégique du manager sur la mise en œuvre de la logistique inverse (RL) ainsi que les relations entre la RL et les performances environnementales et économiques, Nous avons également utilisé ce modèle pour étudier les effets modérateurs de la certification ISO 14001 sur la RL et la performance environnementale, ainsi que le rôle modérateur de la taille de l'entreprise sur la RL et la performance économique, sur un échantillon de 55 équipementiers du secteur automobile Marocain. Les résultats suggèrent que l'importance du gouvernement et la RL sont négativement liés. En ce qui concerne les autres déterminants de la RL, les résultats de l'étude montrent que la RL est positivement lié à l'importance des actionnaires, des clients, des employés et de la posture stratégique du dirigeant. Cependant, l'importance de la communauté locale n'exerce aucune influence sur la RL. De plus, cette étude conclut que la RL peut améliorer les performances environnementales et économiques. De plus, nos résultats ont montré qu'avec la taille de l'entreprise, la RL augmente le niveau de performance économique, de plus, l'interaction entre la RL et la certification est positivement liée à la performance environnementale.

Mots clés : Logistique inverse ; implémentation ; performance ; environnemental ; économique.

Introduction

Morocco is growing towards a green economy in line with ecological balances and capable of opening up new opportunities for wealth creation and sustainable jobs. This perspective is now part of the new sustainable development strategies (Baddaoui, 2017). In recent times, growing pressures from organizations have sparked growing interest in the evaluation of reverse supply chains in terms of sustainability, including economic, ecological and social aspects.

Over 25 years ago, Ginter & Starling (1978) defined reverse logistic as a central element in economic activities. Indeed, the main role of the consumer (Cannon & Homburg, 2001), the increased environmental regulation (Henriques & Sadorsky, 1996) and the strategic change of companies (Madsen & Ulhøi, 2001), in addition to many other aspects, activities such as return, refurbishment, renovation, recycling of products and packaging have been increased. All these activities constitute the most common procedures in the RL (Rogers & Tibben-Lembke, 1999). Reverse logistics has grown economically and strategically. Many companies have started to consider returns as possible alternatives for gaining or maintaining a competitive advantage (Zhu & Sarkis, 2007). Returns may be necessary for a variety of reasons, with inventory becoming obsolete, used or defective / damaged products, and end-of-life products. The destination of a product in the RSC depends on several factors, including the remaining value (damage, size and material), the ease of disassembly, the possibilities of reuse or recycling, the number of products available and their nature (Prahinski & Kocabasoglu, 2006). However, despite its importance, most companies have implemented this discipline solely as a consequence of government regulations (Daugherty et al., 2003). This problematic leads to an interesting question: What are the decisional factors that influence the decision to set up RSC? Although several models have been developed to describe RSC (de Brito & Dekker, 2004; Srivastava & Srivastava, 2006), research in the context of developing countries remains weak (El Baz et al., 2017). Starting from a desire to advance research in RL in Morocco, our article will address the question of the implementation of RSC in companies in the automotive sector in Morocco to determine the motivations and observe the extent of RSC in environmental and economic practices in these companies. Therefore, to answer our objective which is to know if the concepts of RL are taken into account by companies in Morocco, three research questions are addressed:

Q1) How do companies in the Moroccan automotive sector implement RL practices?

Q2) What factors affect the implementation of RL?

Q3) What are the impacts of the implementation of RL on economic and environmental performance?

To achieve this objective, the design of our research was articulated around three main stages. A first part composed of a literature review in order to cover the theoretical elements essential to the understanding of our subject and able to provide an answer to the problem. A second part, which will present our conceptual framework through the ULLMAN's model and the formulation of research hypotheses. And a third confirmatory part, carried out in three successive stages: (1) a stage of specification of the theoretical model makes it possible to build, on the one hand, the measurement model linking each latent variable (theoretical construct) to its manifest variables (items or measurement indicators), and on the other hand, the structural model linking the latent variables and translating our research hypotheses. (2) A second step in testing the hypotheses involves estimating the structural model reproducing the supposed relationships between the latent constructs. Specific constraints, in particular the size of the sample and the non-normality of the distributions of the variables studied, led us to complete this confirmatory analysis using the Structural Equation Modelling on PLS. This confirmatory phase is closed by analysis, interpretation of results and discussion of research hypotheses, taking into account the quality of adjustment of the respective models (3).

1. Literature review

1.1. Motivations for the implementation of RSC

1.1.1 RSC and environmental aspect

Zhang et al. (2011), proposed an heuristic study on RL for municipal solid waste management systems. The involvement in strategic planning and operational execution, of manufacturers, waste managers, suppliers, and distributors is important. In the same case of waste management, a study carried out by Lee & Lam (2012) on medical waste explains how manufacturers manage to detect problems linked to RL, this study aimed to design and develop services and sustainable products that aim to ensure the efficiency of operations by meeting the needs of customers.

Ecological and economic costs are involved both in order to help reduce the damage caused by the supply chain to the environment. This reduction in damage can be illustrated by a reduction in waste (Sakhraoui et al., 2015).

1.1.2 Reverse logistic and economic aspect

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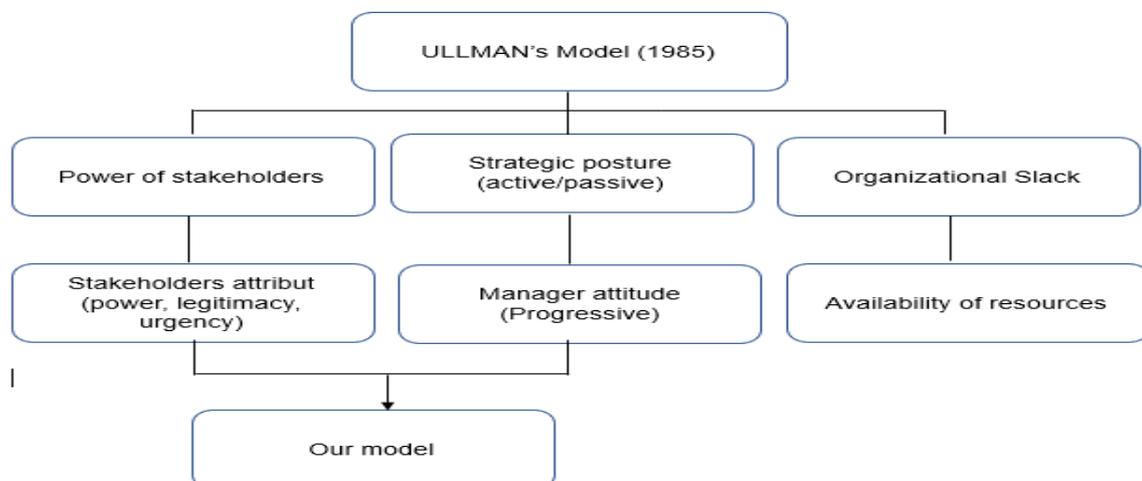
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1.2. Multi-Theoretical conceptual framework : Ullman’s Model

The interaction between external, organizational and individual factors induce to the implementation of RL (Álvarez-Gil et al., 2007). External forces come from the different degrees of pressure administered by stakeholders, and the strength of their claims depends on their importance (Álvarez-Gil et al., 2007). Finally, we will analyse how the strategic preferences of managers impact the final decision on the implementation of RL activities (Álvarez-Gil et al., 2007).

Ullmann (1985) created a theoretical model, involving three dimensions: the power of stakeholders, the strategic posture of managers and the economic performance of companies (see figure 1).

Figure N°1 : Theoretical foundations of the model



Source : Berrone & Husillos (2004)

1.2.1 Hypotheses related to the impact of stakeholders on the decision of implementing reverse logistic

The main idea behind the stakeholder theory is that managers have obligations with multiple groups such as employees, suppliers, customers, shareholders and local communities. Although their nature varies, each group expects that the society, through its managers, to pay attention and focus its effort on meeting its demands.

In other words, stakeholders have several claims that society can satisfy through RL activities. For example, customers can claim extended warranty periods following returns or repair activities. Recycling can meet the demand of the O.N.G. since it is a responsible environmental behavior (González-Benito & González-Benito, 2006). The goal of maximizing shareholder profit requires controlling costs and increasing profit, which can be achieved through the reuse of equipment and materials (Dowlatshahi, 2000). These examples help illustrate the relevance of the stakeholder theory seen as external forces that stimulate and encourage RL activities.

From the previous paragraphs, we will base our study on a cross between Ullman's model (1985) and Alvarez and Al., (2007), which consists of two main variables.

Customer importance related to RL

Dowlatshahi (2000) argued that customers drive RL implementation, based on their identity, their needs and their willingness to support RL. Companies must take into account the specific characteristics (quality, reliability, delivery) that customers want or expect from remanufactured or recycled products. Mollenkopf et al. (2000) have pointed out that clients influence the return management process. As customer demand for "more environmentally friendly" products increases, a business is more likely to establish an effective and efficient RL system (Álvarez-Gil et al., 2007). Regarding legitimacy, Stock et al. (2002) argued that return is a necessary evil and that as long as products are sold, there will always be returns, thereby motivating companies to put in place appropriate RL systems. Regarding urgency, Guide Jr et al. (2000) have pointed out that the return of clients due to remorse or poor quality is a matter of urgency.

The first hypotheses of this research can be formulated as follows:

H1. The importance of customers has a positive effect on the implementation of RL

Shareholders importance related to RL

An important aspect of the power of shareholders is their relentlessness in wanting to obtain profit maximization, which therefore requires cost control and increased profit, obtained through the reuse of equipment and materials (Álvarez-Gil et al., 2007). Shareholders will suffer significant losses on their investments if a company is declared responsible for environmental damage, linked to the accumulation and non-processing of returns, this largely explains the legitimacy of this category of stakeholder (Buysse et al., 2010). On the other hand, according to the study of Alvarez et Al., (2007), RL programs require long-term investments. which are likely to impede short-term profit. Therefore, the shareholders become reluctant to engage in investments with uncertain gains (Álvarez-Gil et al., 2007).

H2. The importance of shareholders has a positive effect on the implementation of RL

Government importance related to reverse logistic

Government has the potential to control, legislate or influence company policies and practices (Daugherty et al., 2001). Rahman and Subramanian (2014) conclude that government regulation is considered to be one of the main factors influencing the implementation of end-of-life computer recycling operations in Australia. As government regulatory requirements for green products increase, a company is more likely to get involved in advanced environmental programs and establish an effective and efficient RL program (Lai & Wong, 2012). Some studies have even argued that government agencies have the greatest power over a company's RL (Abdulrahman, M. D., Gunasekaran, A., Subramanian, 2014; Ellram & Carter, 1998; Murphy, 2002). Regarding legitimacy, Dowlatshahi (2000) argued that companies adopt RL to comply with existing and future legislation, such as strict environmental and packaging regulations, which can be used to become more responsible for their residual products. In a study by Gonzalez-Benito and Gonzalez-Benito (2006), the environmental pressure exerted by government agencies directly affects the implementation of environmental logistics practices.

Based on these arguments, it is proposed that:

H3. The importance of government has a positive effect on the implementation of RL.

The importance of employees in terms of RL

The Orange Grove Recycling Center of Chattanooga in Tennessee succeeds in selling recyclable raw materials, creates jobs for more than a hundred mentally handicapped people who would not otherwise be on the job market, which explains the importance of the

employees in the activities of the RL. Considering the uncertainty and variability of the end of life or the recycling of materials, several companies operating in the RL recruit temporary workers in emergency (Houseman et al., 2001).

In Europe, RL requirements have increased since the introduction of directives on waste (EEE). A new set of personnel, skills, accommodation, infrastructure, trucks and expertise has emerged to manage the work of the RL in this regulatory environment.

Consequently, regulations can continue to create job stability in RL, hence the legitimacy of employees in the implementation of this activity. In addition, the development of a return process can be supported by the use of reusable containers, they can offer significant safety benefits, such as eliminating the cutting process, reducing handling of broken pallets; moreover, standardized containers facilitate the use of automated systems, which reduces manual operations; and since errant packaging materials will be lessened this will create a cleaner environment, and thus reduce potential accidents (Del Brío & Junquera, 2003).

In view of this, it is proposed that:

H4. The importance of employees has a positive effect on the implementation of RL

The importance of local communities in terms of RL

These are stakeholders who play an important role in building credibility and acceptance of its activities. Local communities are becoming more and more interested in logistics activities. "Logistics, like taxation or subsidy policy, is one of the factors in the economic policy of a local community" (Michel & Dornier, 2007). Several factors explain why local communities are increasingly interested in logistics activities (Masson & Petiot, 2012). Given this, it is proposed that

H5. The importance of local communities has a positive effect on the implementation of RL.

1.2.2 Hypotheses related to the impact of the manager's strategic posture on the decision to set up the RL

Organizational strategic profiles reflect the individual preferences of senior management. Their personal opinions are very likely to influence the company's strategic decisions. In general, the manager can adopt two opposite strategic attitudes:

- The progressive attitude which is characterized by an active search for the satisfaction of the demands of the stakeholders, a permanent control of the environment, the search for competitive advantages and commercial opportunities, and less aversion for risk: This attitude is associated with proactive behavior (Álvarez-Gil et al., 2007). A

company has an active posture if its attitude influences the relationship between her and an important stakeholder in order to reach an optimal level of interdependence (Berrone & Husillos, 2004). On the other hand, a more progressive strategic attitude implies that the manager understands that it is better to anticipate the stakeholder before the latter acquires the missing attributes, or he is convinced that he could be strategically advantageous to do so (Dowlatshahi, 2000a; Ellram & Carter, 1998; Kopicki et al., 1993; Stock et al., 2002).

- On the other hand, a conservative attitude which is associated with greater risk aversion and a commitment to maintain the status quo and therefore reactive behavior (Wiersema & Bantel, 1992). Companies with passive position will only carry out RL activities due to external or internal pressures leading to the reactive execution of these programs (Kopicki et al., 1993).

On the other hand, a proactive company does not wait for inevitable pressures before the implementation of LR systems (Kopicki et al., 1993).

This is summarized in the hypotheses below:

H6. A progressive strategic posture of the manager has a positive effect on the implementation of RL

1.2.3 Hypotheses related to the impact of RL on performance

RL performance has traditionally been viewed as encompassing both direct economic benefits (cost savings) (Jack et al., 2010) and improved customer satisfaction (Jayaraman & Luo, 2007; Mollenkopf et al., 2011). However, nowadays, environmental performance has become increasingly important, since extended producer responsibility has become a key element of public environmental policy in several countries (Shuangyu & Kohji, 2007). The recovery of the products used and the recovery of their value are important elements for building the green image of the company. The efficiency of these services can be improved by environmental compliance and waste disposal (Jayaraman & Luo, 2007). Therefore, this study will assess the performance of RL considering both economic and environmental aspects.

- **RL and environmental performance**

Judge and Douglas (1996) defined environmental performance as an organizational commitment to environmental excellence in various fields and operational activities. Our study adapted the definition of Judge and Douglas (1996) in the context of RL and

environmental performance as being an organizational commitment to environmental excellence in relation to the implementation of RL (Huang & Yang, 2014).

Regarding the measurement of environmental performance, Azzone and Noci (1996) proposed that environmental performance is made up of four dimensions: external environmental efficiency, environmental efficiency of the company, green image and environmental flexibility. Shuangyu and Kohji (2007) have argued that environmental performance indicators consist of environmental management performance and environmental operational performance. Carter and Ellram (1998) have argued that RL can proactively minimize the threat of government environmental regulation and can improve the green image of the business. In addition, Jayaraman and Luo (2007) have pointed out that taking over a company from its end-of-life products and products not only reduces the volumes of its waste, but also massively helps it build the green image of the company.

H7. There is a positive relationship between the implementation of RL and the environmental performance of the company.

- **RL and economic performance**

Regarding economic performance, Daugherty et al. (2003) suggested that companies rely on several critical assumptions for their RL operations: • business costs will be contained and financial objectives will be achieved; • customer relations will be maintained / improved and the company will adhere to any regulatory mandate; And • management will be satisfied with the overall functioning of the system. These hypotheses suggest that measures of economic performance in RL should be considered in a multidimensional context.

One study has suggested that efficient systems can reduce costs, increase revenues, improve profitability and promote customer satisfaction, thereby providing companies with a competitive advantage (Jack et al., 2010; Li & Olorunniwo, 2008). Companies that implement RL can not only reduce the impact of its activities on the environment, by eliminating waste, but also strengthen customer loyalty and increase profits. Autry et al. (2001) concluded that recovering products for manufacturing, repairing, reconfiguring and recycling the product could make businesses profitable. Biederman (2006) found that, when managed effectively, RL systems can deliver benefits, including competitive advantage, better visibility and more efficient operations, through better use of space, work planning and inventory control.

H8. There is a positive relationship between the implementation of RL and the economic performance of the company

1.2.4 Test of the moderating role of size on the relationship between reverse logistic and performance

- **Test of the moderating role of size on the relationship between reverse logistic and economic performance**

This study includes the size of companies as a control variable. The control variable size is considered to be the number of employees in the company (Child, 1972).

After integrating the direct effect of company size on economic performance, we will test the moderating role of size on the relationship between RL on economic performance. We will check whether the results obtained are in line with the hypotheses formulated, and whether the interaction effect which particularly interests us here shows that with the size of the company, RL increases the level of economic performance.

H9. With the size of the company, RL increases the level of economic performance

Test of the moderating role of certification on the relationship between reverse logistics and environmental performance

This study includes ISO 14001 certification, and the size of companies as control variables. ISO 14001 certification, which refers to environmental management. If a company surveyed had been certified ISO 14001, it will be coded 1, if it is not 0 (Delmas & Toffel, 2008).

After integrating the direct effect of ISO 14001 certification on environmental performance, we will test the moderating role of certification on the relationship between RL on environmental performance. We will check if the results obtained are in line with the hypotheses formulated, and if the interaction effect which particularly interests us here shows that with the certification of the company, RL increases the level of environmental performance.

H10. With ISO 14001 Certification, RL increases the level of environmental performance.

2. Methodology

2.1. Sampling and data collection

The data collection method chosen for this study is the survey. Indeed, we have tried, as far as possible, to rely on scales and items already used in other researches adopting the same concepts of our research. To generate and write our survey, the starting point is the interview guide used in the exploratory phase; this guide highlights the main topics of our research. In this case, we have rephrased some questions by adapting them to the objectives of our research hypotheses and we have added others, which seem relevant to us. Then, we carried

out a pre-test of the survey face to face, close to a reduced sample of ten managers belonging to the automotive suppliers between the city of Bouskoura, Kenitra and Tangier, including another five researchers and academics.

Thus, some questions were poorly understood, the main topics of the survey and the coding were also not clearly presented. After correcting these shortcomings, we administered the survey to the equipment manufacturers in the automotive sector in Morocco. In this case, we contacted the Moroccan Association for the Automotive Industry and Trade (A.M.I.C.A) by phone and email several times in order to be able to collect the list including the name, and the contact of all the equipment manufacturers of the automotive sector in Morocco. Fortunately, the same association has put in our hands a list including 132 Moroccan equipment manufacturers, but what limits our work is the fact that we have not been able to reach the whole equipment manufacturers. This is due to several reluctance from some companies, which led us to collect a sample limited to 55 companies, thus having a response rate of 41%. We conducted an online survey using the "Google forms» tool. Thus, the response rates are between 24% and 79%, our response rate of 42% is within the norm compared to this type of study, but the sample of 55 is slightly above below are the usual recommendations for the minimum sample size to use in structural equation models. Indeed, various sampling constraints led us to lower our initial ambitions and resort to a convenience sample. In this practice, the researcher contacts all the people who are accessible to him to create a sample with regard to the criteria taken into account. Fortunately, the literature reassures us that this approach can be accepted for research where the theoretical aspect is dominant (Calder et al., 1982).

2.2. Description of the characteristics of the sample

Table N°1 : Description of the sample

Companies types					
		Workforce	Percentage	Valide percentage	Cumulated Percentage
Valid	A large company (workforce between 500 and 1.000 employees)	11	20,0	20,0	20,0
	A small and medium-sized company (workforce less than 500 employees)	11	20,0	20,0	40,0
	A very large company (workforce greater than 1000 employees)	33	60,0	60,0	100,0
	Total	55	100,0	100,0	
Professional experiences					
		Workforce	Percentage	Valide percentage	Cumulated Percentage
Valid	0 to 3 years	24	43,6	43,6	43,6
	3 to 6 years	11	20,0	20,0	63,6
	6 to 10 years	10	18,2	18,2	81,8
	More than 10 year	10	18,2	18,2	100,0
	Total	55	100,0	100,0	
ISO14001 Certification					
		Workforce	Percentage	Valide percentage	Cumulated Percentage
Valid	NO	14	25,5	25,5	25,5
	YES	41	74,5	74,5	100,0
	Total	55	100,0	100,0	

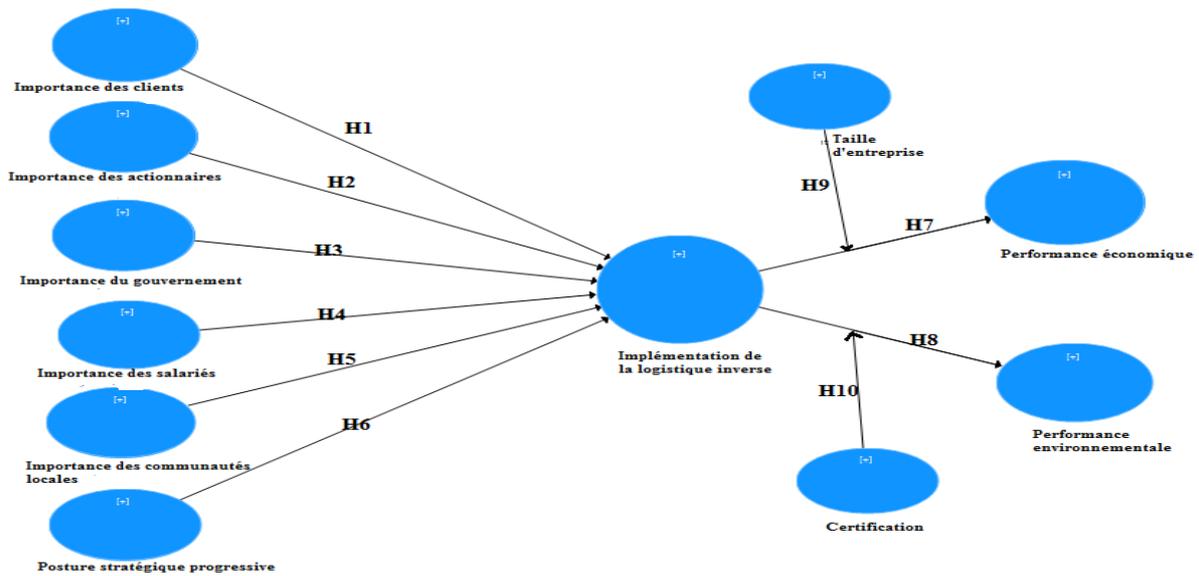
Source : SPSS 21

The results of the descriptive analysis concerning the characteristics of the companies in our sample are presented in table 1. This shows that the majority of the companies in our sample are very large (60% workforce greater than 1000 employees). The majority of respondents have less than or equal to 6 years of experience. Finally, 74.5% of companies in our sample are ISO 14001 certified.

2.3. Validation of measurement scales by ACP analyses

The main objective of this paragraph is to highlight the validity of the measurement scales such as the measurement scale of the importance of customers, shareholders, employees, government, local communities, strategic posture, implementation of RL and economic and environmental performance. In this case, factor analysis in main components ACP was performed taking into consideration all the variables proposed in our research. If the ACP analysis gives, more than one factorial axe, a second ACP analysis with Varimax rotation will be performed. A reiteration between the calculation of Cronbach's alpha and factor analysis allowed us to measure the psychometric qualities of the scales.

Figure N°2 : Measurement model refined in ACP



Source : SPSS 21

2.4. Testing the validation of the hypothesis

The objective of this part is to analyze the relationships between the different latent variables integrated into our research model. This analysis, using structural equation methods using the PLS approach, allows to confirm or deny all of our research hypotheses. In this case, we present the statistical analyses of the data in two steps. Firstly, we started by estimating the reliability and validity of the measurement scales in order to ensure the stability of the psychometric qualities obtained before, during the ACP. Secondly, we expose the results from the confrontation of research hypotheses with the results of the structural model.

2.4.1 Validation and estimation of the model by the PLS method

As we specified before, we use for the analysis of final data the structural equation method variance-type "the PLS approach". To do this, as a first step, we check the validity of the measurement model with our final sample (n = 55). The measurement model, also called an external model, represents the assumed linear relationships between the latent variables and the latent variables. As a second step, we estimate the structural model by studying the significance of the structural links.

Evaluation of the measurement model

In order to evaluate our measurement model, we carried out the technique of the PLS Algorithm in the Smart-PLS software. The results of this analysis are used to evaluate the reliability of the latent variables, the convergent validity and the discriminant validity.

- **Evaluation of the reliability**

To evaluate the reliability, we first examined, the loadings of the items, the general reliability of the variable is also calculated using the “Composite Reliability” concordance index proposed by Werts, Linn and Jöreskog (1974). The Dillon-Goldstein rho represents the Composite Reliability Index and is used like the Jöreskog rho calculated in the LISREL approach. The accepted threshold for these three indices, namely loadings, Cronbach's Alpha and Dillon-Goldstein Rhô, is 0.70. Then, the analysis of the reliability of the measurement scales followed by the AVE (Average Variance Extracted) allows us to evaluate the convergent validity of the constructs. The value of the AVE must be greater than 0.50 (Fornell & Larcker, 1981).

Assessment of discriminant validity

Table 2 shows us that the square root of the A.V.E is greater than the correlations of each construct with the other constructs. These results mean that the capacity of each measure to generate results different from the measures of other constructs, therefore discriminant validity is ensured for all of our items.

Table N° 2 : Corrélations entre construits et la racine carrée de l’A.V.E

	1	2	3	4	5	6	7	8	9
RSC Implementation (1)	0,7141								
Importance of shareholders (2)	0,2804	0,7840							
Importance of the customers (3)	0,3279	0,6504	0,7337						
Importance of local communities (4)	0,2291	0,3449	0,1814	0,7670					
Importance of the employees (5)	0,2901	0,1446	0,1896	0,5071	0,7356				
Importance of the government (6)	0,0955	0,5429	0,2915	0,6675	0,2655	0,7396			
Environmental performance (7)	0,3036	0,1182	0,0406	0,1912	0,1907	-0,0388	0,9377		
Economic performance (8)	0,2626	0,2194	0,1445	0,1026	0,1354	-0,1397	0,6331	0,8365	
Progressive strategic posture (9)	0,3198	0,0462	0,0152	0,2228	0,2213	0,0366	0,5656	0,3724	0,7685

Source : SPSS 21

Once the reliability, the convergent validity and the discriminant validity are assured, we now need to evaluate the quality of the model

Evaluation of the quality of the model

In the context of the PLS method, the quality of the model can be estimated by observing the Stone-Geisser Q^2 coefficient and the coefficients of determination (R^2 and R -adjusted), which allow us to understand the contribution of each independent variable to the estimation of the dependent variable in regard to the explained variance of the dependent variables. Overall, the validity of the structural model is ensured by calculating the GoF (Goodness of Fit) index through the average of communalities and the average of R^2 of endogenous variables.

- **Evaluation of the quality of the measurement model**

The dependent variables of our measurement model are the implementation of RL, economic performance and environmental performance. The results presented in the table below, produced by the technique of the PLS algorithm, show that all the variables introduced into our model explain globally $R^2 = (25.50\%)$ of the RL and which in turn explain $R^2 = (6.9\%)$ of the economic performance and $R^2 = (9.22\%)$ of the environmental performance. Depending on the size of our sample, which can be considered as a minimum size, we can see that the values of R^2 respect the limit of 0.02 minimum suggested by Wetzels et al. (2009). Therefore, these results confirm that our model is significant.

- **Assessment of the quality of each block of variables**

The table below shows that the Stone-Geisser Q^2 coefficients (cv-redunancy) of the endogenous variables are positive and different from zero for all the endogenous variables. In view of the results obtained in the table below, it should be noted that all the coefficients are positive, which testifies the predictive validity of our model.

- **Assesment of the quality of the structural model**

Table 3 presents the communality values, R^2 and adjusted R of the endogenous variables, and also the average of these values which allow the GOF index to be calculated.

Table N° 3 : R² and the communality of dependent variables

	R deux	R ajustée	Communality	Coefficient Q²
Importance of shareholders			0,6145	
Importance of the customers			0,5379	
Importance of local communities			0,5886	
Importance of the employees			0,5400	
Importance of the government			0,5478	
Progressive strategic posture			0,7625	
RSC Implementation	0,2550	0,162	0,5099	0,0347
Environmental performance	0,0922	0,075	0,8793	0,0795
Economic performance	0,0690	0,051	0,6998	0,0463
Average	0,1387	0,091	0,6311	0,0535
GoV	29,59%			

Source : SPSS 21

In addition, the quality of the structural model is also ensured by calculating the value of the GoF (Goodness of Fit) index. This index shows a satisfactory value close to 30% [$\sqrt{0.1387 \times 0.6311}$], these results obtained allow us to conclude the overall validity of the structural model. The validation parameters of the measurement and structural model thus presented and justified, we will present in the next paragraph the validation test of the hypotheses of our research model.

Structural model estimation and hypotheses testing

Testing hypotheses involves estimating the structural model reproducing the supposed relationships between the latent constructs. The validation of hypotheses depends on the importance and statistical significance of the structural relationships obtained. Thus, the significance of the coefficients was estimated by a bootstrap procedure. We used the bootstrapping approach (Chin et al., 2003), because it provides the two essential measures of the structural model: a value of t (similar to the t-test) and R² (the same as in multiple regressions).

2.4.2 Results on the relationships between stakeholder dimensions, implementation of reverse logistics, economic performance and financial performance

The step of testing hypotheses consists in evaluating the direct effects between the latent variables that make up our model in the sense of the supposed structural relationships. Thus, we used the bootstrapping which allows to stabilize the estimates of the coefficients and to calculate the error which allows the determination of the significance of these structural

coefficients. In this sense, the validation or rejection of an hypotheses will depend on the value and the significance of the t Student (Chin et al., 2003). Indeed, the hypotheses are statistically significant at the threshold of 1%, 5% and 10% (or $p \leq 0.01$; $p \leq 0.05$; $p \leq 0.1$). Above the 10% threshold, the significance of the hypotheses will not be retained. Our conceptual model can be formalized as follows, by integrating the different structural coefficients related to the formulated hypotheses. Table 4 summarizes all the results concerning the direct relationships of our research. The results are detailed below for each of the hypotheses.

Table N° 4 : Results of direct relationship estimates

Hypotheses	Corrélations Coefficient	T Statistics (O/STERR)	Hypothesis Status
Importance of the customers -> RSC Implementation	0,2217**	2,2402	Confirmed
Importance of local communities -> RSC Implementation	0,1252 ns	1,5064	Rejected
Importance of the employees -> RSC Implementation	0,1558*	1,6625	Confirmed
Importance of the government -> RSC Implementation	-0,1917**	1,9776	Confirmed but in the opposite sense
Importance of shareholders -> RSC Implementation	0,1629*	1,6171	Partially confirmed
Progressive strategic posture -> RSC Implementation	0,2535***	2,6712	Confirmed
RSC Implementation -> Environmental performance	0,3036***	3,5153	Confirmed
RSC Implementation -> Economic performance	0,2626***	3,048	Confirmed

Note : Significance threshold ***1 % ; **5 % ; *10 % . ns : insignificant effect

Source : Open Full Report (Smart PLS-SEM)

It appears from these statistical coefficients in the table above that, contrary to our theoretical expectations, the importance of government and RL is negatively linked (coeff = -0.192). This shows that the importance of government negatively affects the level of implementation of the RL at the 5% significance level. This result is not surprising because the leaders have a negative perception of the aids and subsidies granted by the State to the RL therefore, the perception of the importance of the government by leaders would not be an advantageous factor for the decision of implementing RL in the companies of our sample. With regard to the other determinants of the implementation of RL, the statistical results obtained go in the direction of the hypotheses formulated: the RL is positively related to the importance of the shareholders at a threshold close to 10% (coeff = 0.1629), to the importance of customers at a threshold of 5% (coeff = 0.2217) and employees at 10% (coeff = 0.1558). The progressive

strategic posture is positively linked to the RL (coeff = 0.2535), at the threshold of 1%. However, the importance of the local community has no significant influence on the level of implementation of the RL (the significance level is greater than 0.15). Concerning the effects of RL, it should be noted that economic and environmental performance is positively and significantly linked to the implementation of RL (coeff1 = 0.2626; coeff2 = 0.3036) at the significance thresholds of 1%.

The results obtained are summarized in the following table.

Table N° 4 : Results of direct relationship estimates

Code	Results		
Results on reverse logistics catalysts			
H1+	The importance of customers has a positive effect on RSC Implementation	$\beta_1 > 0$	Confirmed
H2+	The importance of shareholders has a positive effect on the RSC Implementation	$\beta_2 > 0$	Partially valid
H3+	The importance of government has a positive effect on the RSC Implementation	$\beta_3 < 0$	Significant in the opposite direction
H4+	The importance of employees has a positive effect on the RSC Implementation	$\beta_4 > 0$	Confirmed
H5+	The importance of local communities has a positive effect on the RSC Implementation	$\beta_5 > 0$	Rejected
H6+	A progressive strategic posture of the manager has a positive effect on the RSC Implementation	$\beta_6 > 0$	Confirmed
Results on reverse logistics effect			
H7+	RSC Implementation has a positive effect on economic performance	$\beta_7 > 0$	Confirmed
H8+	RSC Implementation has a positive effect on environmental performance	$\beta_8 > 0$	Confirmed

Source : Own

2.4.3 Validation testing of moderation hypotheses under the PLS approach

In this paragraph, we will present the procedure for testing the effects of moderation and the results related to each variable: the size of companies and the existence of certification.

In order to test the moderating effect, we will solve the following two structural equations.

$$1) Y = \beta_1 X + \beta_2 Z + \xi$$

$$2) Y = \beta_1 X + \beta_2 Z + \beta_3 X * Z + \xi$$

The regression equations in 2) are called "structural equations".

The coefficients β or γ are called "structural coefficients" and the errors ξ are "structural disturbances". X , Z and $X * Z$ are exogenous variables and Y is an endogenous variable.

For the interpretation of the empirical results, if the regression coefficient β_3 is significant and if the coefficient of determination (R^2) of the second regression is greater than the first one, in order to show that the addition of the moderating effect improves the predictive validity of the model (Aiken et West, 1991), then the moderating effect of Z is established. If β_2 remains significant, we are in the presence of a quasi-moderating effect.

Table N° 5 : Direct and moderating effects of the size and certification

Hypothesis link		Correlation coefficient	T Statistics	status of the correlation link
RSC Implementation -> Environmental performance		0,307***	3,4223	Significant at a threshold of 1%
RSC Implementation -> Economic performance		0,2348***	2,5834	Significant at a threshold of 5%
Certification -> Environmental performance		0,0998 ns	1,4643	Very slightly significant at a threshold of 15%
Size of the company -> Economic Performance		0,0194 ns	0,2798	Non significatif
Moderation effect	RSC Implementation * Certification -> Environmental performance	0,1602**	2,0698	Significant at a threshold of 5%
	RSC Implementation * Company size -> Economic Performance	0,1967***	2,6356	Significant at a threshold of 1%

Legend : Significance level ***1 % ; **5 % ; *10 % . ns : non significatif effect

Source : Open Full Report (Smart PLS-SEM)

- **Test of the moderating role of size on the relationship between reverse logistics and economic performance**

After integrating the direct effect of company size on the level of economic performance, the results obtained are in line with the hypotheses made. The interaction effect which particularly interests us here shows that with the size of the company, RL increases the level of economic performance ($\beta = 0.1967$; at the significance level of 1%), at the moment when company size has no significant effect on economic performance ($\beta = 0.0194$). Therefore, hypothesis H9 is validated. Furthermore, taking into account this interaction effect improves the explained variance of economic performance (R^2 went from 6.9% to 10.4%).

- **Test of the moderating role of certification between reverse logistics and environmental performance**

The statistical results in the table above also show that certification is positively linked to the level of the RL ($\beta = 0.0998$; but the significance level is greater than 15%), while the

interaction between the RL and the certification positively increases environmental performance ($\beta = 0.1602$; also significant at the 5% level). Therefore, hypothesis H10 is validated. Furthermore, when we introduce this interaction effect, the explained variance of environmental performance (R-two went from 9.2% to 12.1%).

3. Discussion and implications of the results

3.1. Theoretical implications of the implementation of RSC and its performance

The theoretical implications of the results relate to the confirmation of the theoretical framework and the contributions in terms of RSC implementation and performance measurement. The contribution of the study to existing literature is threefold. First, we present a theoretical model that simultaneously integrates external, organizational and individual factors. Originally, RSC studies were descriptive and based on anecdotal evidence. More recently, researchers have noted the relevance of conducting research on RSC on a theoretical basis (Daugherty et al., 2003; Delmas & Toffel, 2008; Guide & Van Wassenhove, 2003).

By extending this field of research, the study suggests a stakeholder approach as a promising framework in which to conduct future research. To our knowledge, few or almost none of the empirical Moroccan work has integrated this dimension into the study of RL.

The results of our analyzes show that there is no relationship between the implementation of RL and the importance of local communities, unlike some studies in Europe (A. & Năsi, 1997; Masson & Petiot, 2012), this informs us about the lack of involvement of this category in Morocco taking into consideration the environmental aspect of businesses.

In addition, authors have shown the moderating role of certain control variables such as the size, certification and age of the company (Huang & Yang, 2014; Husillos & Álvarez, 2008) but little work found a statistically significant relationships between these two dimensions (Company size / economic performance, Certification / environmental performance) in the field of logistics in general and in RSC in particular.

Finally, our study provides an empirical data from an African point of view where environmental concerns remains timid. The general objective of our study was to analyze the situation of Moroccan automotive suppliers in order to locate RL and sustainable development in the logistics chain.

3.2. Managerial implications of the implementation of RSC and its performance

Several implications can emerge from our study, firstly, the role of sustainable development is an important element for understanding the catalysts of RSC (Álvarez-Gil et al., 2007; de

Brito & Dekker, 2004), for this reason, we have sought to link RSC to the economic and environmental dimension of companies in the automotive sector.

Second, the results of our study confirm our hypotheses regarding the importance of customers, indeed, an investigation of the main factors in the management of the green supply chain shows that there are certain differences. While customers are cited as important drivers, government plays only a secondary role. The implementation of a green supply chain can therefore be characterized as mainly market-oriented. One reason for this is the fact that in automotive suppliers, the customers are the originators, who are themselves required by law to respect environmental aspects. As a result, they demand green products and processes from their suppliers. Customers are therefore a driving force, and RSC remains one of the ways that car manufacturers can gain a competitive advantage.

Thirdly, as mentioned above, contrary to our theoretical expectations, the importance of the government and the RSC are negatively linked. This result is not surprising because the leaders have a negative perception of the aid and subsidies granted by the State for RL activities. In our sample, the perception of the importance of the government by leaders would therefore not be a favourable factor in the decision to implement RL of the companies. In this perspective, there is a lack of Applicable laws and legislations to motivate companies to implement RSC or standardize recycling procedures, no tax benefit to encourage investment in such activities, and no aid and subsidies for small businesses.

Fourth, the hypotheses concerning the importance of the employees has been validated. The idea behind is that the establishment of such an activity can help the creation of new positions and departments dedicated to RSC as it's the case in Europe or in English-speaking countries, in addition to investments in the latest technologies and standardization of practices and procedures, this last point already exists, but only in large multinational companies.

Fifth, the hypotheses concerning the importance of the shareholders is partially validated, in a sense, this goes hand in hand with our theoretical remarks cited above, but this partiality starts from the observation in which, the shareholders are sometimes reluctant for implementing such activity, due to investments likely to decrease short-term profits. As a result, shareholders may be reluctant invest in activities whose results are uncertain.

Conclusion

By extending this field of research, the study suggests a stakeholder approach as a promising framework in which to conduct future research. To our knowledge, few or almost none of the empirical Moroccan work has integrated this dimension into the study of RL.

Our hypotheses on the manager's strategic posture has been confirmed. Stakeholder literature indicates that the survival of the company depends on the proper management of stakeholder claims (Clarkson, 1995; Henriques & Sadosky, 1996). In other words, if the manager cannot properly satisfy this part, the survival of the company may be threatened. Indeed, a more conservative manager will tend to ignore the expectations of stakeholders. The literature review on RL refers to this situation as being inattentive of management, that is to say that the manager will favor the status quo (Rogers & Tibben-Lembke, 1999).

Our study provides an empirical data from an African point of view where environmental concerns remains timid. The general objective of our study was to analyze the situation of Moroccan automotive suppliers in order to locate RL and sustainable development in the logistics chain.

This study demonstrated an overview of RSC within Morocco and more specifically among companies in the automotive sector, which is booming and shows the interest for companies to pay particular attention to the process of categorizing their stakeholders, as this makes it possible to determine the order of strategic priorities.

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