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RESEARCH ARTICLE

AN INTEGRATED METHODOLOGY TO ASSESS SOCIAL PERFORMANCE OF SUPPLY CHAIN

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Abstract

Despite the fact that the concept of sustainable development originally included a clear social mandate, since a long time this social dimension has been neglected amidst abbreviated references to sustainability that have focused on economic and environmental issues.Now, social performance is a hot topic for researchers in management science. It is also one of the major concerns of supply chain leaders. To assess this performance, there are increasingly many management tools. It is then appropriate to wonder the role of these tools in supply chain: are these tools meet real organizational needs? Or they are used to promote supply chain image face institutional constraints increasingly strong?
In this context, many modules and methodologies have been established in literature in order to evaluate social performance of supply chain, since it has become an important issue for society. However, few of them analyze social impacts. So, this work presents an integrated methodology to perform this evaluation, based on issues which significantly affect the society. We purpose a module which will allow the assessment of this performance. This module was tested in an automotive supply chain in north of Morocco.

Introduction:-

For about twenty years greater attention has been given to sustainability as an essential condition for the long-term profitability and competitiveness of a firm (Carter and Rogers 2008). This major awareness frequently derives from internal and external pressures, such as legislative factors, various stakeholder actions and pressures (Wolf 2014). On one hand, sustainability has become a challenging issue because it recalls not only economic aspects, but also environmental and social considerations that the organizational behavior should follow. On the other hand, it is recognized by global organizations as a strategic goal (Closs et al.2011).

Sustainability is a multidimensional construct that enlarges the economic bottom line concept, which focuses on the efficient use of resources and on achieving a return on investments, by adding social considerations and promoting greater ecological responsibility (Elkington 1997). Given that each company is part of a wider network and is not an island in today's business world (Ford et al. 2003), there is a great importance in relationship management that requires acting beyond company boundaries. Recently, the way of gaining a competitive advantage has modified the structure of the competition, so that competition between companies has turned into inter-supply chain competition

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(Hult et al. 2007; Gold et al.2010).
Now it is the supply chain that assumes an important role in promoting sustainability (Linton et al. 2007; Carter and Rogers 2008). The biggest challenge for an individual producer in today's world of interconnected supply chains is to ensure sustainability penetration in multiple layers of the supply chain (Schoenherr et al. 2012) and to develop strategies to improve environmental and socio-ethical performance all along the supply chain (Vermeulen and Seuring2009).

Our purpose here is to trace the evolution of a particular branch of sustainable development concerned with its social dimensions and implications – social sustainability – whilst highlighting ways in which theidea still connects with broader bio-physical, environmental and economic issues and challenges. Indeed, we would argue that a better understanding of the concept's social elements is crucial in reconciling the often competing demands of the society–environment–economy tripartite.

We are also concerned that the many and varied contributions of social scientists have led to a degree of conceptual chaos and that this compromises the term's utility. Some work conducted under the rubric of social sustainability (Kalmijn and Arends2010) is clearly focussed on meeting basic needs and addressing 'underdevelopment', whilst others are equally concerned about changing the deleterious behaviour of the world's affluent and the promotion of stronger environmental ethics. Other scholars seem to see social sustainability more in terms of maintaining or preserving preferred ways of living or protecting particular socio-cultural traditions. Some of these preferences – living in low-density suburbs, or insisting on access to 'traditional' fishing grounds and species, for example – are not always seen as sustainable in a bio-physical environmental sense, thus there is a great deal of potential for conflict to occur.

This concern prompted us to examine the work conducted on the social dimensions of sustainable development and summarise these varied attempts to define, organize and operationalize 'social sustainability'.

Therefore, the aim of this paper is to provide a module for evaluating social performance of supply chain. This paper is organized as follows: First, we give a brief overview of supply chain and the Corporate social responsibility (CSR) . Second, we propose a module to assess this performance. In the third paragraph, we apply our module in a case study. Finally, we report our findings, discussions and conclusion.

Literature Review:-

Supply chain:-

Definition:-

There are in literatures many definitions of supply chain. Of these, we adopt the following one: "A supply chain is a system of subcontractors, producers, distributors, retailers and customers between which exchanges the material flows in the sense from suppliers to customers and information flow in both senses" (Tahir and Darton2010). In supply chain, we distinguish three types of flows: physical, informational and financial. Physical flows relate to all materials that pass through the supply chain from upstream to downstream (raw materials, intermediate products and finished products). Other materials can flow from downstream to upstream, such as containers, packaging, pallets, product returns or end-of-life products in the case of reverse logistics. Informational flows concern exchange of information and data between actors of chain (stocks and outstanding level, customer demand, etc.) which are made in both sense. Finally, financial flows are the cash flows associated with the physical flow.

Types of supply chain:-

Typologies of supply chain different following the properties of players involved there:

- If the sites are located in different countries, it is called global supplychain.
- If partners all belong to the same legal entity (even if the firm is multi-sites) it is called internal supplychain.
- If several firms are working within supply chain, but one of them plays a dominant and central role, it is called an extendedenterprise.
- In case where several firms are working within the supply chain, but where steering is decentralized or at least semi decentralized with bilateral negotiations between pairs of partners, it is called a virtualfirm.

Supply chain function:-
The supply chain functions ranging from raw material purchase to sale of finished products through production, storage and distribution:

- Supplying: is the most upstream function of supply chain. Supplied materials and components constitute from 60% to 70% of costs of manufactured products (Ouzizi2005) in a majority of firms.
- Production: the production function is central in supply chain, this is the skills hold by firm to manufacture, develop or transform raw materials into products orservices.
- Storage: the storage includes all quantities stored throughout the process beginning with raw material, components, work in progress and finally finishedproducts.
- Distribution and transport: transportation of raw materials, transportation of components between plants, transportation of components to storage centers or to distribution centers and delivery of finished products tocustomers.
- Sale: the sale function is the ultimate function in a supply chain; its effectiveness depends on performance of functionsupstream.

Decisions in supply chain:-
Supply chain management is a widely studied topic in scientific literature. We will approach it from a sustainable point of view, which today is more innovative.
We can classify decisions about supply chain management in three categories (Galasso 2007):

- **Strategic decision:** concerns decisions taken by senior management on long term (from six months to several years).
- **Tactical decision:** is concerned with decisions taken by the company's executives over the medium term that is to say from a few weeks to few months.
- **Operational decision:** has a more limited scope in space and in time. These are decisions taken by team leaders during a day or a week.

Supply chain Management:-
Like supply chain, the concept of supply chain management has led to several definitions, among these, we adopt the following one:

"Supply chain management is a set of approaches used to effectively integrate suppliers, producers, distributors, so that merchandise is produced and distributed in the right quantity, at the right place and at the right time in order to minimize costs and ensure the service level required by customer." (Simchi-Levi et al. 2000).

Corporate social responsibility (CSR):-
CSR has become an attractive research line with considerable practical value in recent years. Nowadays, the necessity and importance of CSR makes the managers and planners to highlight CSR elements in corporate missions, visions, values and strategies (Cruz and Wakolbinger2008). CSR is translated as the impact of corporate activities on different social groups (or stakeholders), including environment protection, human right, work place safety, proper conditions for employees, etc. (Carter and Jennings 2002a). Since the CSR tries to integrate the social and economical aspects to create more value for the whole society (Carroll and Buchholtz2002; Bowen 1953), it plays significant role in the sustainable development of countries. Additionally, in the view of firms' managers, CSR can enhance the brand and social image of corporate besides reducing risks. On the other hand, ignoring of CSR may bring high pressures on corporate from media, activists, non-governmental organizations, professional unions and other groups of society.

These pressures affect the profitably and sustainability of corporate activities. For example, popular corporations such as McDonalds, Shell and Wal-Mart have experienced damages to their reputation and sales resulted from media reports and campaigns by advocacy and social groups (Amaeshi et al. 2008). To make a socially responsible corporate, it is not sufficient to only control the level of social responsibility within the boundary of corporation's ownership, rather the level of social responsibility should be also assured at other partners within the supply chain network (Cruz 2009).

Despite the importance of supply chain social responsibility, the relevant literature is not wide. As primary works in this area, Carter and Jennings (2002b) put significant step forward in incorporating the concept of CSR into the supply chain management (SCM) context.

There are a little interest in social performance of supply chain. Indeed, while the overall sustainable development works has taken into account the economic (Maria et al. 2009) and environmental dimensions, very little works have considered the social dimension and social quality (Pamela et Claire 2011).

Proposal of a module to assess social performance of supply chain:-

Description of considered supply chain:-

We consider the case of a multi-echelon supply chain which is composed from several potential suppliers and subcontractors, several production sites and several clients. Also, we consider several regions where production sites are located. The assumptions of mathematical module are as follows:

1. Supply chain is managed centrally by a single entity which coordinates alloperations.
2. Planning horizon ismulti-periods.
3. Part of production can be outsourced on one or moreperiods.
4. Suppliers and subcontractors are assumed to be logistics partners usual of the supplychain.
5. Supply chain does not have its own transport fleet and use externalproviders.
6. Production processes are convergent: more incoming products are mixed or assembled together to get the outgoing product (automotive industry forexample).

Identification of social performance indicators

We based our selection of indicators on the three requirements recommended by (Roy 1985):

1. **Completeness**: must not that too little issues, otherwise, it means that some assessment elements were not taken intoaccount.
2. **Non-redundant**: must not that some indicators which are duplicated, thus more thannecessary.
3. **Consistency**: global preferences (for all issues) are consistent with local preferences (for a single issue).

Table 1:- presents the five major social issues of our module.

Tab. 1:- Social indicators of supply chain.

N°	Issue	Indicator	Symbol	Unity	Impact	I_{Inf}	I_{Sup}
1	Labor rights	Cases of no respect of free competition	FC	Number	Négatif	0	Staff number
2		Cases of injustice caused by hierarchical power	HP	Number	Négatif	0	Staff number
3		Cases of discrimination	Di	Number	Négatif	0	Staff number
4		Staff victims of corruption	VC	Number	Négatif	0	Staff number
5		Staff representatives	Re	Number	Positif	0	Staff number×0.02
6		Staff who practicing a forced labor	FL	Number	Négatif	0	Staff number
7		Staff who are children	Ch	Number	Négatif	0	Staff number
8		Staff number participated in professional elections	PE	Number	Positif	0	Staff number
9		Cases of violations of privacy	VP	Number	Négatif	0	Staff number
10	Working conditions	Ratio of lowest wage / cost of local life	LW/LL	%	Positif	0	1
11		Level of salary retention in case of illness	SI	%	Positif	0	1
12		Services offered to staff	SS	Number	Positif	0	20*
13	Health and security	Staff victims of occupational accidents	OA	Number	Négatif	0	Staff number
14		Staff victims of diseases caused by work	DW	Number	Négatif	0	Staff number
15	Societal commitment	Jobs created	Jo	Number	Positif	0	Staff number at end of period t
16		Staff with CID** at the end of the period t	CID	Number	Positif	0	Staff number at end of period t
17		Staff with CDD*** at the end of the period t	CDD	Number	Négatif	0	Staff number at end of period t

18		CDD* transformed to CID	CDD-CID	Number	Positif	0	CDD number at beginning of period t
19		Layoffs	La	Number	Négatif	0	Staff number at beginning of period t
20		Budget destined to promote social activities	SA	M€	Positif	0	Total Supply Chain Budget ×0.1
21	Consumers	Products / Services subject of complaint by consumers	CC	Number	Négatif	0	All sold products / services

*: estimated number
**CDD: Contract for a Determinate Duration
***CID: Contract for a Indeterminate Duration

Determinatinof social indicatorsvalues:-
We consider that supply chain contains N entity (suppliers, subcontractors, production sites,customers,…), such as $N \in [1, +\infty[$:

The value of social indicators expressed in number is calculated by the sum of its value in all entities over the period t (year in general). For example to calcul the value of "cases of discrimination",we have to use the following equation (01):

$$\mathbf{N_{d,t}} = \sum_{\mathbf{i=1}}^{\mathbf{i=N}} \mathbf{n_{di,t}} \qquad (\mathbf{01})$$

Such as :$di,t$is the number of discrimination incidents at the entity i of supply chain over the period t. The value of social indicators expressed in percentage is calculated by the sum of products of percentage in an entity i by its weight (In terms of staff number) compared by all supply chain over the periodt.
For example to calculate the value of "Percentage of participation in professional elections", we have to use the following equation (02):

$$\mathbf{P_{Pe,t}} = \sum_{\mathbf{i=1}}^{\mathbf{i=N}} \mathbf{p_{i,t}} \times \mathbf{P_{pei,t}} (\mathbf{2})$$

Suchas:$i,t$is the rate of staff of entity i compared by all staff of supply chain and $P_{pei,t}$isthepercentageofparticipationinprofessionalelectionsinentityiofsupply chain at the period t.

Measuring social performance of supply chain:-
Integrated information on social performance of a supply chain is very essential for decision-making, but it is very difficult to evaluate because of too many indicators. The proposed module reduces the number of indicators by aggregating them into a composite social index ($I_{Soc,t}$) which reflects the social performance of supply chain (Fig.1).

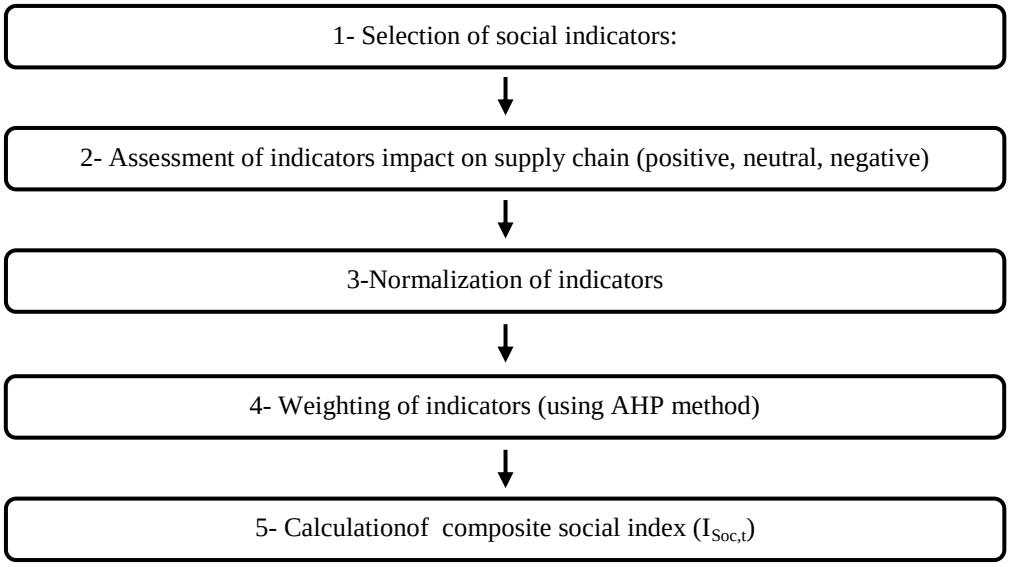

Fig. 1:- Calculation procedure of social performance index of supply chain.

Social indicators are divided into two groups:-

- Nineindicatorswhoseincreasingvaluehaveapositiveimpact(I_A^+)onsocialperformanceofsupply chain (Table 1):
- Twelve indicators whose increasing value have a negative impact (I_A^-)on social performance of supplychain:

For example, increased value of "Cases of discrimination" clearly has a negative impact on social performance of supply chain , while increased value of "Budget destined to promote social activities" has a positive impact on social performance of supply chain.

The main problem of aggregating indicators into $I_{Soc,t}$is the fact that indicators are expressed in different units. One way to solve this problem could be normalizing each indicator i using equations (03) and (04).

$$\mathbf{I^+_{N,it} = \frac{I^+_{A,it} - I^+_{Inf,t}}{I^+_{Sup,t} - I^+_{Inf,t}}} \quad (\mathbf{03}) \qquad \mathbf{I^-_{N,it} = 1 - \frac{I^-_{A,it} - I^-_{Inf,t}}{I^-_{Sup,t} - I^-_{Inf,t}}} \quad (\mathbf{04})$$

Where$I^+_{N,it}$is the normalized indicator i (with positive impact) over the time t and$I^-_{N,it}$ is the normalized indicator i (with negative impact) over the same time t.

Thus the possibility of incorporating different kinds of values, with different units of measurement is offered. Among the advantages of the proposed normalization of indicators is the clear compatibility of different indicators, since all indicators are normalized.

Next procedural part of calculating of $I_{Soc,t}$involves determining weights, which should be combined with each indicator. The weights of social indicators can be obtained from social experts surveys or from public surveys about social themes. Therefore, to derive the weights practically, the Analytic Hierarchy Process (AHP) was used in thismodule.

We build a matrix *A*= (n x n) (in our case n=21), where indicators are compared 2 by 2 by the decision maker. The comparisons are made by posing the question which of two indicators i and j is more important from social point of view. The intensity of preference is expressed on a factor scale from 1 to 9 (Table2).

Tab. 2:- Comparison scale of AHP method (Hafeez2002).

Preferencefactor,p	Importancedefinition
1	Equalimportance
3	Moderate importance of one overanother
5	Strong or essential importance of one overanother
7	Very strong or demonstrated importance of one overanother
9	Extreme importance of one overanother
2,4,6,8	Intermediatevalues
Reciprocal,1/p	Reciprocal for inversecomparison

The value of 1 indicates equality between the two indicators while a preference of 9 indicates that one indicator is nine times more important than the one which it is being compared. This scale was chosen,because in this way comparisons are being made within a limited range where perception is sensitive enough to make a distinction. In the matrix A, if indicator i is "p-times" the importance of indicator j , then necessarily, indicator j is " 1/p times " the importance of indicator i , where the diagonal $a_{ii} = 1$ and reciprocal property $a_{ji} = (\frac{1}{a_{ij}})$ such as i, j = 1,…, n .

Weight of indicator i (Wi) is given by the equation (05) below:

$$\mathbf{W_i} = \frac{\sum_{k'=1}^{k'=n} \frac{a_{ik'}}{\sum_{k=1}^{k=n} a_{kk'}}}{\mathbf{n}} \qquad (\mathbf{05})$$

One disadvantage of AHP method outlined in literature (Dyer 1990) is the problem of intransitivity preferences. Indeed, pair wise comparison may lead to the non-transitivity that cannot be removed as part of AHP method.

However, perfect consistency rarely occurs in practice. In AHP method the pair wise comparisons in a judgment matrix are considered to be adequately consistent if the corresponding Consistency Ratio (CR) is less than 10% (Saaty1980). CR coefficient is calculated as follows: first a Consistency Index (CI) needs to be estimated. This is done by adding the columns in the judgment matrix and multiply the resulting vector by the vector of priorities (i.e., the approximated eigenvector) obtained earlier. This yields an approximationof them aximumeigen value, denotedby λ_{max}. Then, CIvalueiscalculatedbyusing theformula:

$$\boldsymbol{CI} = \frac{\boldsymbol{\lambda_{max} - 1}}{\boldsymbol{n - 1}} \qquad (\mathbf{06})$$

Next, CR is obtained by dividing CI by Random consistency Index (RI) as given in table 3 below.

Tab. 3:- RI values for different values of n.

n	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45

Otherwise matrix A should be evaluated:

$$\boldsymbol{CR} = \frac{\boldsymbol{CI}}{\boldsymbol{RI}} \qquad (\mathbf{07})$$

Finally, composite social index (ISoc,t) in period t can be derived as shown in equation (08) below:

$$\boldsymbol{I_{Soc,t}} = \sum_{i=1}^{i=9} \boldsymbol{W_i} \times \boldsymbol{I^{+}_{N,it}} + \sum_{i=1}^{i=12} \boldsymbol{W_i} \times \boldsymbol{I^{-}_{N,it}} \ \boldsymbol{where} \ \sum_{i=1}^{i=21} \boldsymbol{W_i} = \mathbf{1} \ \boldsymbol{and} \ \boldsymbol{W_i} \geq \mathbf{0} \quad (\mathbf{08})$$

Application:-

The reliability of the proposed module has been tested in a case study. We chose an automotive supply chain installed in north of Morocco which its principal business activity is electrical harnesses for automobile.

The data needed have been obtained from the human resource departments. This supply chain is constituted of:

- Three of production sites (inMorocco)
- Eight suppliers (inMorocco)
- Three customer (in United Kingdom, France and UnitedStates)

To evaluate social performance, our proposed module was applied to the case chain and $I_{Soc,t}$was delivered for the two years 2015 and2016.

N.B : Before calculating average of each social indicator of this supply chain,note that level of social aspects of customers (favorable social environment) is very hgier than those of suppliers and in production sites (bad socialenvironment).

Creating the composite social index for a case supply chain:-

The social dimension of sustainability reflects the attitude of the company to the treatment of its own employees, suppliers, contractors and customers, and also its impact on society at large. Good socialperformance is important in ensuring a license of company to operate over a long term ((Institution of Chemical Engineers (IChemE) 2002). However, it is very difficult to incorporate the social dimension of the sustainable development. Therefore, there are still very few social indicators developed and measured. Tables 4 and 5 presentvalues of social indicators of the case supply chain for the years 2015 and 2016 consecutively.

To determine the weights of indicators, pair-wise comparisons of indicators according to their impact to social performance assessment of supply chain have been performed. Priorities are assumed and may vary as to opinion of decision-makers of supply chain. The results are shown in table 6.

Data of the case supply chain does not measure all social indicators using common units. However, that is neither expected nor possible. To get rid of units, the normalization of indicators was performed using equation (03) and (04). In that way indicators became combinable and derivation of ($I_{Soc,t}$) was possible.

To calculate composite social index $I_{Soc,t}$in time t, the normalized value of each indicator was multiplied by its weight (Equation (08)) (Tables 7 and 8).

Thus, social performances of this supply chain for the years 2015 and 2016 were determined (Table 7 and 8) .

Tab. 4:- Values of social indicators of the case supply chain in year 2015

N°	Indicator (I)	Unity	I_{2015}	I_{Inf}	I_{Sup}	I_N
1	Cases of no respect of free competition	Number	926	0	28782.000	0.968
2	Cases of injustice caused by hierarchical power	Number	946	0	28782.000	0.967
3	Cases of discrimination	Number	1506	0	28782.000	0.948
4	Staff victims of corruption	Number	1012	0	28782.000	0.965
5	Staff representatives	Number	545	0	575.640	0.947
6	Staff who practicing a forced labor	Number	0	0	28782.000	1.000
7	Staff who are children	Number	0	0	28782.000	1.000
8	Staff number participated in professional elections	Number	23310	0	28782.0000	0.810
9	Cases of violations of privacy	Number	512	0	28782.000	0.982
10	Ratio of lowest wage / cost of local life	%	0.4	0	1	0.400
11	Level of salary retention in case of illness	%	0.6	0	1	0.600
12	Services offered to staff	Number	9	0	20	0.450
13	Staff victims of occupational accidents	Number	890	0	28782.000	0.969
14	Staff victims of diseases caused by work	Number	3529	0	28782.000	0.877
15	Jobs created	Number	982	0	28782.000	0.034
16	Staff with CID* at the end of the period t	Number	25657	0	28782.000	0.891
17	Staff with CDD** at the end of the period t	Number	3125	0	28782.000	0.891
18	CDD* transformed to CID	Number	230	0	3355.000	0.069
19	Layoffs	Number	438	0	28238.000	0.984
20	Budget destined to promote social activities	M€	0.365	0	4.962	0.074
21	Products / Services subject of complaint by consumers	Number	9903	0	449300.000	0.978

Tab. 5:- Values of social indicators of the case supply chain in year 2016.

N°	Indicator (I)	Unity	I_{2016}	I_{Inf}	I_{Sup}	I_N
1	Cases of no respect of free competition	Number	942	0	28000.000	0.966
2	Cases of injustice caused by hierarchical power	Number	1002	0	28000.000	0.964
3	Cases of discrimination	Number	1600	0	28000.000	0.943
4	Staff victims of corruption	Number	1073	0	28000.000	0.962
5	Staff representatives	Number	545	0	560.000	0.973
6	Staff who practicing a forced labor	Number	0	0	28000.000	1.000
7	Staff who are children	Number	0	0	28000.000	1.000
8	Staff number participated in professional elections	Number	20100	0	28000.000	0.718
9	Cases of violations of privacy	Number	617	0	28000.000	0.978
10	Ratio of lowest wage / cost of local life	%	0.4	0	1	0.400
11	Level of salary retention in case of illness	%	0.5	0	1	0.500
12	Services offered to staff	Number	7	0	20	0.350
13	Staff victims of occupational accidents	Number	843	0	28000.000	0.970
14	Staff victims of diseases caused by work	Number	3740	0	28000.000	0.866
15	Jobs created	Number	822	0	28000.000	0.029
16	Staff with CID* at the end of the period t	Number	23500	0	28000.000	0.839
17	Staff with CDD** at the end of the period t	Number	4500	0	28000.000	0.839
18	CDD* transformed to CID	Number	215	0	4715.000	0.046
19	Layoffs	Number	420	0	28598.000	0.985
20	Budget destined to promote social activities	M€	0.325	0	4.962	0.065
21	Products / Services subject of complaint by consumers	Number	10100	0	453300.000	0.978

Tab.6:- Pair-wise comparison matrix for evaluation of estimated weights of indicators.

	FC	HP	Di	VC	Re	FL	Ch	PE	VP	LW/LL	SI	SS	OA	DW	Jo	CID	CDD	CDD-CDI	La	SA	CC	Poids
FC	1	1	1/2	1	1	1/3	1/3	1	1/2	1/2	1	1	1/2	1/2	1/2	1/2	1	1	1/2	1	1	0.031
HP	1	1	1/2	1	1	1/3	1/3	1	1/2	1/2	1	1	1/2	1/2	1/2	1/2	1	1	1/2	1	1	0.031
Di	2	2	1	2	2	1	1	4	1	2	2	2	1	1	2	2	2	2	2	2	1	0.072
VC	1	1	1/2	1	1	1/3	1/3	1	1/2	1/2	1	1	1/2	1/2	1/2	1/2	1	1	1/2	1	1	0.031
Re	1	1	1/2	1	1	1/2	1/2	1/2	1	1	1	1	1/2	1/2	1	1	1	1	1/2	1	1	0.036
FL	3	3	1	3	2	1	1	4	1	2	2	2	1	1	2	2	2	2	2	2	1	0.076
Ch	3	3	1	3	2	1	1	4	1	2	2	2	1	1	2	2	2	2	2	2	1	0.076
PE	1	1	1/4	1	2	1/4	1/4	1	1/3	1/3	1/3	1/2	1/4	1/4	1/3	1/3	1/3	1/3	1/4	1/3	1/2	0.021
VP	2	2	1	2	1	1	1	3	1	1	1	2	1	1	1	1	1	1	1	1	1	0.053
LW/LL	2	2	1/2	2	1	1/2	1/2	3	1	1	1	2	1	1	1	1	1	1	1	2	1	0.050
SI	1	1	1/2	1	1	1/2	1/2	3	1	1	1	2	1	1	1	1	1	1	1	2	1	0.045
SS	1	1	1/2	1	1	1/2	1/2	2	1/2	1/2	1/2	1	1/2	1/2	1/2	1/2	1/2	1/2	1/3	1	1	0.030
OA	2	2	1	2	2	1	1	4	1	1	1	2	1	1	2	2	2	2	2	3	1	0.069
DW	2	2	1	2	2	1	1	4	1	1	1	2	1	1	2	2	2	2	2	3	1	0.069

Jo	2	2	1/2	2	1	1/2	1/2	3	1	1	1	2	1/2	1/2	1	1	1	1	1/2	2	1/2	0.044
CID	2	2	1/2	2	1	1/2	1/2	3	1	1	1	2	1/2	1/2	1	1	2	1	1/2	1	1	0.045
CDD	1	1	1/2	1	1	1/2	1/2	3	1	1	1	2	1/2	1/2	1	1/2	1	1	1/3	1	1	0.038
CDD -CDI	1	1	1/2	1	1	1/2	1/2	3	1	1	1	2	1/2	1/2	1	1	1	1	1/2	1	2	0.039
La	2	2	1/2	2	2	1/2	1/2	4	1	1	1	3	1/2	1/2	2	2	3	2	1	3	1/3	0.059
SA	1	1	1/2	1	1	1/2	1/2	3	1	1/2	1/2	1	1/3	1/3	1/2	1	1	1	1/3	1	1	0.033
CC	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	3	1	1	0.053

Tab. 7:- Social performance of case supply chain of year 2015.

N°	Indicator (I)	Unity	Wghit	I_{N2015}	Social performance
1	Cases of no respect of free competition	Number	0.031	0.968	**0.792 (79.165%)**
2	Cases of injustice caused by hierarchical power	Number	0.031	0.967	
3	Cases of discrimination	Number	0.072	0.948	
4	Staff victims of corruption	Number	0.031	0.965	
5	Staff representatives	Number	0.036	0.947	
6	Staff who practicing a forced labor	Number	0.076	1.000	
7	Staff who are children	Number	0.076	1.000	
8	Staff number participated in professional elections	Number	0.021	0.810	
9	Cases of violations of privacy	Number	0.053	0.982	
10	Ratio of lowest wage / cost of local life	%	0.050	0.400	
11	Level of salary retention in case of illness	%	0.045	0.600	
12	Services offered to staff	Number	0.030	0.450	
13	Staff victims of occupational accidents	Number	0.069	0.969	
14	Staff victims of diseases caused by work	Number	0.069	0.877	
15	Jobs created	Number	0.044	0.034	
16	Staff with CID* at the end of the period t	Number	0.045	0.891	
17	Staff with CDD** at the end of the period t	Number	0.038	0.891	
18	CDD* transformed to CID	Number	0.039	0.069	
19	Layoffs	Number	0.059	0.984	
20	Budget destined to promote social activities	M€	0.033	0.074	
21	Products / Services subject of complaint by consumers	Number	0.053	0.978	

Tab. 8:- Social performance of case supply chain of year 2016.

N°	Indicator (I)	Unity	Wghit	I_{N2016}	Social performance
1	Cases of no respect of free competition	Number	0.031	0.966	**0.766 (77.597%)**
2	Cases of injustice caused by hierarchical power	Number	0.031	0.964	
3	Cases of discrimination	Number	0.072	0.943	
4	Staff victims of corruption	Number	0.031	0.962	
5	Staff representatives	Number	0.036	0.973	
6	Staff who practicing a forced labor	Number	0.076	1.000	
7	Staff who are children	Number	0.076	1.000	
8	Staff number participated in professional elections	Number	0.021	0.718	
9	Cases of violations of privacy	Number	0.053	0.978	
10	Ratio of lowest wage / cost of local life	%	0.050	0.400	
11	Level of salary retention in case of illness	%	0.045	0.500	
12	Services offered to staff	Number	0.030	0.350	
13	Staff victims of occupational accidents	Number	0.069	0.970	
14	Staff victims of diseases caused by work	Number	0.069	0.866	

15	Jobs created	Number	0.044	0.029	
16	Staff with CID* at the end of the period t	Number	0.045	0.839	
17	Staff with CDD** at the end of the period t	Number	0.038	0.839	
18	CDD* transformed to CID	Number	0.039	0.046	
19	Layoffs	Number	0.059	0.985	
20	Budget destined to promote social activities	M€	0.033	0.065	
21	Products / Services subject of complaint by consumers	Number	0.053	0.978	

To calculate composite social index $I_{Soc,t}$ in time t, the normalized value of each indicator was multiplied by its weight (Equation (08)) (Tables 7 and 8).

Tab. 9:- Values of composite social index $I_{Soc,t}$ of concerned supply chain.

Year	2015	2016
Social performance of concerned supply chain ($I_{Soc,t}$)	0.792	0.766

Interpretation ofR:-

Composite social index for a case supply chain over two period of time (2015 ; 2016) was calculated (Fig. 3). $I_{Soc,t}$ of the case supply chain reached the highest value in the year 2015, but for this year,social performance was decreased downwardly. Following these results, the case supply chain is not on a truly social path.

Social performance of this supply chain has been decreasing from year to year. It had some issues on which its social performance was not progressing like it should. We can explain this decrease in social performance by increasing the values of some negative indicators and the decreasing of values of other positive inducateurs (Table 5). Decreasing in social performance indicate that this supply chain should improve some social aspects to achieve a higher level than in 2015.

Twenty two social indicators (nine have a positive impact and twelve have a negative impact on social performance of supply chain) were aggregated into composite social index as presented in (Tables 7 and 8). The variation of$I_{Soc,t}$of case supply chain over a time interval of years 2015-2016 is graphically presented in Fig. 2.

For any given year, the $I_{Soc,t}$reveals the development of the supply chain in that year compared to the other years. Following the $I_{Soc,t}$of the case supply chain for a time interval 2015-2016, it shows how the supply chain is progressing over the time: if the index is higher in year Y + 1 than it was in year Y, the social performance of the supply chain has improved over that period and viceversa.

However, the social development affects, but does not determine the overall performance results. The social development of the supply chain has slightly dwindled.

The $I_{Soc,t}$ can also show in what sense (positive or negative) and at what rate of social performance is the supply chain moving either towards or away from social development in the period 2015-2016. In the some way, the socially regression of this supply chain was demonstrated. Negative rates of social performance in the period measured indicate that the case supply chain should improve social environment. However, the supply chain should ensure continuous improvement in all social aspects.

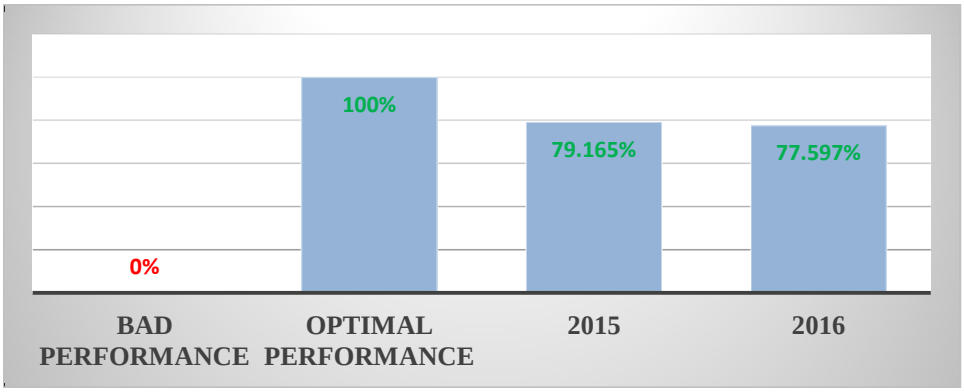

Fig. 2:- Variation of social performance of the case supply chain over time interval 2015-2016.

Contribution of composite social index and its pertinence fordecision-making:-

The importance of social side for all stakeholders of supply chain requires the determination of its value.So, by this composite social index, we can get a simplified and quantified expression of social performance of any supply chain. This index (composite social index), can be used to inform decision- makers about social performance achieved throughout their supply chain, and then the determination of actions which should be applied. However, it may also be used to provide information to critical decisionprocesses. $I_{Soc,t}$helps us to improve social performance and where best practices might be found. The decision-makers of supply chain could easily interpret this index, then finding the correct sense which they should react. If enclosed in the periodic social report, $I_{Soc,t}$could also be used to present the progress of the supply chain to the various parties interested in social performance of supply chain. As $I_{Soc,t}$would be applied in different supply chains, it would be possible to compare and rank them in terms of social performance.

By this module, we provide for the decision maker a tool which allows him:-

- To analyze the current and potential value of activities implemented and to consider actions to strengthen this value as such the implementation of social best practices. This analysis allows him to define the scope of activities and to consider several options for this end, as part of differentiation strategy byCSR.
- To analyze the profile of the social performance related to supply chain decisions during the planning phase, choose the configuration of the chain and the way to exploit it in advanced and optimized manner in order to ensure target level of social performance. This level of social performance defines the strategy or CSR policy that the decision maker wishes toimplement.
- To know precisely the additional investment in terms monetary, which he must engage to achieve the level of social performancedesired.
- And finally, to have quantitative performance indicator which used to control the supply chain and for the purposes ofcommunication.

Conclusion:-

Some organizations have made tremendous progress in social protection abreast of recent years. Faced with popular and regulatory pressures, they have had no choice but to develop an social management increasingly rigorous. However, in most organizations, social side remains on the margins of activity producing value. This is one reason why social protection is seen even today as an additional production cost.

Applying the principles of sustainable development in industrial management, in other words, CSR is still a difficult task. In this sense, companies have very little knowledge and tools and consulting firms are often helpless against the demands of companies that want to engage in CSR. Since the concept of CSR was first proposed, it has remained a challenge to organizations that struggle to determine how it can be operationalized and measured (Richard et al. 2014).

In the origin of this paper, was the problem of taking into account the social impacts of supply chain practices. In this context, our goal has been to provide an assessment module of these impacts. It was also for us, to assist in the

definition of judicious and targeted axis of the progress allowing to evolve evaluation systems of social performance in supply chain.

We proposed a module for social decision in the supply chain. We mobilized, among others, the value chain and AHP method. The primary objective of this study is to lay the foundations for a new generation of social indicators that will allow us to know our level in terms of social performance.

Finally, we considered the realistic case of a supply chain issue of the Moroccan automotive industry, which served us the application framework for our mathematical module.

To assure the reliability of this module, we considered core social indicators during its construction. This module presented in this paper promises advance in social performance assessment of the supply chains and makes social information more useful to the decision-makers. Any supply chain and based on thismodule, can know their achievements towards society. Even though further development is called for, it is evident that this module has the potential to become very useful as one of the tools available.

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