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Assessing and improving company's economic performance: Mathematical formulation and a case study

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Abstract
Aim of this paper is to examine and evaluate the evolving character of economic performance in corporations. As we know, economic performance is a hot topic for researchers in management science and it is one of the major concerns of supply chain leaders. In this study, we focus on the contribution of available tools to assess company economic performance. So, because of the strategic importance of this dimension, many models have been established in literature to evaluate company economic performance. However, few of them radically analyze economic issues at company level.
Our paper contributes by presentation of an integrated methodology to assess company economic performance based on issues which significantly affect the company economic dimension. Thus, we purpose a model which will allow the assessment of company economic performance during a definite period. Robustness and efficacy of our model were being tested in an automotive company in north of Morocco.

Keywords: company, economic performance, measure, indicators, model, Analytic Hierarchy Process (AHP) method

1. Introduction
Performance measurement has sense only if it evaluates a progression along one or more pre-selected axes. Everything starts imperatively by developing a solid strategy to set the most opportune development axes for a real and sustainable success. Once the strategy is deployed in company, we can then focus fully on performance measurement theme.
However, conducting a sector study is not the one opportunity to focus on the performance of a sector. Sector performance analysis is of particular interest to those in the financial sector who, for a long time, have taken into account the sectoral dimension in evaluating investment opportunities and in assessing risk level.
To meet objectives, the output of processes enabled by company must be measured and compared with a set of standards. To be controlled, process parameter values need to be kept within a set limit and remain relatively constant. This will allow comparison of planned and actual parameter values, and once done, parameter values can be influenced through certain reactive measures to improve economic performance or re-align monitored value to the defined value. For example, a facilities layout analysis could reveal the cause of long distribution time, high transportation and movement costs and inventory accumulation. Using suitable approaches like re-engineering facilities and subsequent improvements can be possible from analysis of the new design. Thus, processes control in a company is crucial to improving economic performance and can be achieved, at least in part, through measurement. Well-defined and controlled processes are essential for company interest.
There are number of conceptual frameworks and discussions on company economic performance measurements in the literature; however, there is a lack of empirical analysis and case studies on economic performance metrics and measurements in company. Thus, answer to these two questions below will be an important step in solving the problem of company's economic performance measurement.

1. Which economic criteria should be considered in company's economic performance measurement?
2. Could be integrated these criteria into a mathematical model which allow us to measure company economic performance?

2. Literature Review
Performance measurement systems were developed as a means of monitoring and maintaining organizational control, which is the process of ensuring that an organization aims at strategies that lead to the achievement of its overall goals and objectives (Mohan *et al*., 2018) [16]. Performance measures, the key tools for performance measurement systems, play a vital role in every organization as they are often viewed as forward-looking indicators that assist management to predict a company's economic performance and many times reveal the need for possible changes in operations (Nanni *et al*., 1990) [17], (Otley, 1999) [18], (Simons, 1999) [24].
However, the choice of performance measures is one of the most critical challenges facing organizations (Ittner and Larcker, 1998) [13], (Knight, 1998) [14]. Poorly chosen performance measures routinely create the wrong signals for managers, leading to poor decisions and undesirable results.

There are enormous hidden costs in misused performance measures. Shareholders pay the bill each day in the form of overinvestment and acquisitions that do not pay off etc. It is not that management is poor. Simply, it is the wrongly chosen performance measures, which in turn push management to take improper decisions (Ferguson and Leistikow, 1998) [3], (Knight, 1998) [14]. Performance measures must be characterized as financial and non-financial (Haddach *et al*., 2016a) [4], (Haddach *et al*., 2017a) [5], (Haddach *et al*., 2017b) [6].

The perceived inadequacies in traditional accounting performance measures have motivated a variety of measurement innovations such as the economic value measures (Ittner and Larcker, 1998) [13]. Over the last few years an increasing number of consultants, corporate executives, institutional investors and scholars have taken part in the debate on the most appropriate way to measure performance (Rappaport, 1998) [20]. Consultants are willing to demonstrate the mastery of their recommended performance models. Corporate executives show clearly that performance models adopted by their corporations are the most appropriate and successful. Institutional investors debate the advantages of alternative performance models for screening underperforming companies in their portfolios. Finally, scholars develop performance measurement models and test the extent to which existing performance evaluation and incentive compensation systems inspire management decisions and performance itself (Rappaport, 1998) [20].

Traditional performance measurement systems were developed at a time when decision-making was focused at the center of organization and responsibilities for decision-making were very clearly defined. According to (Knight, 1998) [14] "these performance measurement systems were designed to measure accountability to confirm that people met their budget and followed orders". However, during the last two decades it was widely argued (Rappaport, 1986;1998) [21, 20], (Stewart, 1991;1999) [25, 26] that most of the performance measurement systems failed to capture and encourage a corporation's strategy, producing mostly poor information leading to wrong decisions.

2.2. Economic performance measurement

Measuring company' economic performance, which focuses on improving process functioning and increasing overall productivity, is widely discussed in literature. Performance is today inherently multi-criteria and is measured on supply chain scale of one or more phases of product life cycle (Haddach *et al*., 2017c) [7], (Haddach *et al*., 2017d) [8], (Ming-Lang *et al*., 2018) [15]. Approaches of economic performance measurement in company perimeter have adapted to context of economic performance evaluation in supply chain (Haddach *et al*., 2016b) [9].

Any production system, whether limited to a company or extended to a supply chain is seen as an organization whose function is to provide goods or services with quality, time and cost required. The outcome of these actions taken for meeting these objectives is measured by performance indicators which should be defined in advance. Economic performance measurement must be precise because it affects the implementation of corrective actions such as reconfiguration of some processes, load balancing or an increase in production capacity.

Decision makers are responsible for organizing the activities of each company, with the aim of meeting the objectives assigned to them, while seeking to provide dashboards based on local performance assessment indicators of each player, but also of the global supply chain. So, dashboard is defined as a measuring instrument in which a set of indicators allows decision makers to take notice of the state and evolution of systems which are piloted by them (Bouquin, 2004) [1]. Evaluating economic performance of supply chain should be based on the modeled value chain and especially allow to follow value-creating activities (Heeramum, 2003) [12].

3. Methods

3.1 Mathematical model for economic planning of company

Supposing customer demand and resource capacity being known, how company could be configured and exploited optimally, to meet customer demand without exceeding available resources capacity while guaranteeing a high economic performance?

We consider the case of a company which is in relation with several potential suppliers, subcontractors and customers. The assumptions of our model are as follows:

1. Planning horizon is multi-periods.
2. Part of production can be outsourced on one or more periods.
3. Suppliers and subcontractors are assumed to be logistics partners usual of company.
4. Company does not have its own transport fleet and use external providers.
5. Production processes are convergent: more incoming products are mixed or assembled together to get the outgoing product (for example the automotive industry).

3.2 Economic performance indicators

We based our indicators selection on the three requirements recommended by (Roy, 1985) [22].

1. **Completeness:** it must not too little criteria; otherwise, it means that some assessment elements were not considered.
2. **Non-redundant**: criteria must not be duplicated., thus more than necessary.
3. **Consistency:** global preferences (all indicators) are consistent with local preferences (for single indicator).

Numerous studies focus on economic and financial dimension of company performance measurement. The models offer different typologies and classify indicators and issues following different categories.

Analysis of this inventory highlights five key issues, which are reliability, reactivity, flexibility, quality and financial performance.

We consider that company economic performance is measured over a time period t (year in general).

Decision variables of our model are as follow:

Table 1: Model decision variables

Decision variable	Meaning
j	Region
f	Supplier
S	All potential suppliers of raw materials
SC	All potential subcontractors for semi-finished products
p	Product
P	All products
RM	Raw materials
MP	All manufactured products
$MPsf$	All semi-finished manufactured products
MPf	All finished manufactured products
$OMPsf$	All semi-finished manufactured products which can be outsourced $P = PM \cup MP; MP = MP_{sf} \cup MP_f; OMP_{sf} \subset MP_{sf}$
CM_p	Unit cost to manufacture product p
X_p	Quantity of product p
CL	Unit cost of labor
Lab_j	All employees residing in region j
CI_p	Unit cost of ownership of stock of product p
I_p	Quantity in stock of product p at the end of period t
CA_{pf}	Unit acquisition cost of product p from the supplier f
QS_{pf}	Quantity of product p purchased from supplier f
CS_{ps}	Unit acquisition cost of product p from the subcontractor s
QSC_{ps}	Quantity of product p purchased from subcontractor s
CTU_{pf}	Unit transport cost of product p between supplier f and company
YSF_{pf}	Quantity of product p transported from supplier f to company
CTU_{ps}	Unit transport cost of product p between subcontractor s and company
$YSCF_{ps}$	Quantity of product p transported from subcontractor s to company
CTU_{pc}	Unit transport cost of product p between company and customer c
YFC_{pc}	Quantity of product p transported from company to customer c

Table 2: Adopted economic indicators of company

Issue	N°	Indicator I	Symbol	Impact	Unit	Value	I_{Inf}	I_{Sup}
Reliability	1	Orders reliability	O_R	Positive	Number	Orders delivered in good conditions	0	All orders delivered
	2	Stocks reliability	S_R	Negative	Hour	Downtime because of an out of stock	0	Total working time
Reactivity	3	Conception reactivity	C_R	Positive	Number	Orders designed on time	0	All orders to design
	4	Procurement reactivity	P_R	Positive	Number	Orders supplied on time	0	All orders to supply
	5	Production reactivity	$P_{R'}$	Positive	Number	Orders produced on time	0	All orders to produce
	6	Reactivity of returned products	R_R	Positive	Number	Returned orders treated on time	0	All returned orders
Flexibility	7	Orders flexibility	O_F	Positive	Number	Quantity achieved to respond to change orders	0	All changed orders
Quality	8	Percentage of defective products	P_D	Negative	Number	Defective products	0	All orders delivered
Financial performance	9	Firm's total cost	T_C	Negative	M€*	T_C	0	Firm's total budget

M€* = millions of euros.

Company financial performance is measured by the total cost of company, expressed in terms of monetary units. Function (F) allow us to calculate and minimize this cost.

$$F = \sum (CM_p . X_p + CL \sum_j Lab_j + \sum_{p \in P} CI_p . I_p) + \sum_{f \in S; p \in RM} CA_{pf} \sum_{i \in F} QS_{pf} + \sum_{s \in SC; p \in MP_{sf}} CS_{ps} \sum QSC_{ps} + \sum_{f \in S; p \in RM} CTU_{pf} . YSF_{pf} + \sum_{s \in SC; p \in OMP_{sf}} CTU_{ps} . YSCF_{ps} + \sum_{c \in C;\ p \in MP_f} CTU_{pic} . YFC_{pic} \quad (1)$$

3.2. Variables definitions and calculations

Integrated information on company economic performance is very essential for decision-making, but it is very difficult to be evaluated because of too many indicators. The proposed model reduces the number of indicators by aggregating them into a composite economic index (IE,t) which reflects company economic performance (Figure 1).

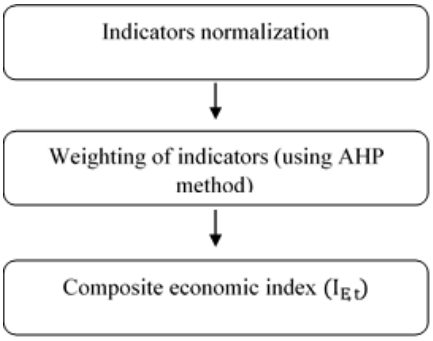

Fig 1: calculation procedure of $I_{E,t}$

Economic indicators are divided into two groups

- Indicators whose have a positive impact (I_A^+) on company economic performance (Table 2).
- Indicators whose have a negative impact (I_A^-) on company economic performance (Table 2).

The main problem of aggregating indicators into IE, t is the fact that are expressed in different units. One way to solve this problem could be normalizing each indicator i by dividing its value over time t by its average value over all the time measured (equations (2) and (3)).

$$I_{N,it}^{+} = \frac{I_{A,it}^{+}}{\bar{I}_{A,i}^{+}} \quad (2)$$

$$I_{N,it}^{-} = \frac{I_{A,it}^{-}}{\bar{I}_{A,i}^{-}} \quad (3)$$

The second way could be normalizing each indicator i using equations (4) and (5).

$$I_{N,it}^{+} = \frac{I_{A,it}^{+} - I_{min,it}^{+}}{I_{max,it}^{+} - I_{min,it}^{+}} \quad (4)$$

$$I_{N,it}^{-} = 1 - \frac{I_{A,it}^{-} - I_{min,it}^{-}}{I_{max,it}^{-} - I_{min,it}^{-}} \quad (5)$$

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 to incorporate different kinds of quantities 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 these last are normalized.

Next procedural part of IE,t calculation involves determining weights, which should be combined with each indicator. Weights of economic indicators can be obtained from economic expert surveys or from public surveys about economic themes. Therefore, to derive the weights practically, Analytic Hierarchy Process (AHP) was used in this model.

We build a matrix A = (n x n) (in our case n=9), where indicators are compared 2 by 2 by the decision maker. The comparisons are made by asking which of two indicators i and j is mor$_e$ important from economic point of view. Intensity of preference is expressed on a factor scale from 1 to 9 (Table 3).

Table 3: comparison scale of AHP method (Hafeez, 2002)

Preference factor, p	Importance definition
1	Equal importance
3	Moderate importance of one over another
5	Strong or essential importance of one over another
7	Very strong or demonstrated importance of one over another
9	Extreme importance of one over another
2,4,6,8	Intermediate values
Reciprocal, 1/p	Reciprocal for inverse comparison

The value 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 has "p-times" of importance compared by indicator j, then necessarily, indicator j has "1/p-times" of importance compared by indicator i, where the diagonal $a_{ii} = 1$ and reciprocal property $a_{ji} = \left(\frac{1}{a_{ij}}\right)$ $such\ as\ i,j = 1..,n.$

Weight of indicators i (W_i) is given by the formula:

$$W_i = \frac{\sum_{k'=1}^{n} \frac{a_{ik'}}{\sum_{k=1}^{n} a_{kk'}}}{n} \quad (6)$$

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% (Saaty,1980). 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 approximation of the maximum eigenvalue, denoted by λ_max. Then, CI value is calculated by using the formula:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (7)$$

Next, CR is obtained by dividing CI by random consistency index (RI) as given in table 4.

Table 4: 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

$$CR=CI/RI \quad (8)$$

Finally, composite economic index 〖(I)〗 _(E,t)) at period t can be derived as shown in equation (09):

$$I_{E,t=}\sum_{i=1}^{3} W_i \times I_{N,it}^{+} + \sum_{i=1}^{8} W_i \times I_{N,it}^{-} \quad \text{where} \quad \sum_{i=1}^{11} W_i = 1 \ \text{ and } \ W_i \geq 0 \quad (9)$$

4. Application

Reliability of proposed model has been tested in a case study. We chose a company which manufactures car seats installed in north of Morocco. Needed data have been obtained from general management team. This company has five suppliers and two customers. To evaluate economic performance of this company, our proposed model was applied to the case company and I_ (E,t) was delivered for the two halves of year 2017.

4.1 Composite economic index for the case company

Table 5 presents values of economic indicators of the case company.

Table 5: Normalized economic indicators of the case company for the first half of year 2017

N°	Indicator I	Symbol	Impact	Unit	I_t	I_{Inf}	I_{Sup}	I_N
1	Orders reliability	O_R	Positive	Digit	169500	0	170000	0.997
2	Stocks reliability	S_R	Negative	Hour	21000	0	1146000	0.982
3	Conception reactivity	C_R	Positive	Digit	95	0	120	0.792
4	Procurement reactivity	P_R	Positive	Digit	3120	0	3400	0.918
5	Production reactivity	P'_R	Positive	Digit	169660	0	170160	0.997
6	Reactivity of returned products	R_R	Positive	Digit	210	0	300	0.700
7	Orders flexibility	O_F	Positive	Digit	750	0	900	0.833
8	Quality of products/services	Q_P	Negative	Digit	612	0	170000	0.996
9	Company's total cost	T_C	Negative	M€	6	0	18	0.667

Table 6: Normalized economic indicators of the case company for the second half of the year 2017

N°	Indicator I	Symbol	Impact	Unit	I_t	I_{Inf}	I_{Sup}	I_N
1	Orders reliability	O_R	Positive	Digit	169800	0	170900	0.994
2	Stocks reliability	S_R	Negative	Hour	17000	0	1203300	0.986
3	Conception reactivity	C_R	Positive	Digit	45	0	57	0.789
4	Procurement reactivity	P_R	Positive	Digit	3051	0	3600	0.848
5	Production reactivity	P'_R	Positive	Digit	170480	0	170800	0.998
6	Reactivity of returned products	R_R	Positive	Digit	310	0	350	0.886
7	Orders flexibility	O_F	Positive	Digit	240	0	270	0.889
8	Quality of products/services	Q_P	Negative	Digit	612	0	170900	0.996
9	Company's total cost	T_C	Negative	M€	9	0	21	0.571

To determine indicators weights, pair-wise comparisons of indicators according to their impact to economic performance assessment of the company have been performed. Priorities are assumed and may vary following the opinion of company decision-makers. The results are shown in Table 6.

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

I	O_R	S_R	C_R	P_R	P'_R	R_R	O_F	Q_P	T_C	Weights
O_R	1	2	2	2	2	2	2	1	1	
S_R	1/2	1	1	1	1	1	1	1/2	1/2	
C_R	1/2	1	1	1	1	1	1/2	1/2	1/2	
P_R	1/2	1	1	1	1	1	1/2	1/2	1/2	
P'_R	1/2	1	1	1	1	1	1/2	1/2	1/2	
R_R	1/2	1	1	1	1	1	1/2	1/2	1/2	
O_F	1/2	1	2	2	2	2	1	1	1/3	
Q_P	1	2	2	2	2	2	1	1	0.5	
T_C	1	2	2	2	2	2	3	2	1	
∑	6.000	12.000	13.000	13.000	13.000	13.000	10.000	7.500	5.333	

O_R	0.167	0.167	0.154	0.154	0.154	0.154	0.200	0.133	0.188	0.163
S_R	0.083	0.083	0.077	0.077	0.077	0.077	0.100	0.067	0.094	0.082
C_R	0.083	0.083	0.077	0.077	0.077	0.077	0.050	0.067	0.094	0.076
P_R	0.083	0.083	0.077	0.077	0.077	0.077	0.050	0.067	0.094	0.076
P'_R	0.083	0.083	0.077	0.077	0.077	0.077	0.050	0.067	0.094	0.076
R_R	0.083	0.083	0.077	0.077	0.077	0.077	0.050	0.067	0.094	0.076
O_F	0.083	0.083	0.154	0.154	0.154	0.154	0.100	0.133	0.062	0.120
Q_P	0.167	0.167	0.154	0.154	0.154	0.154	0.100	0.133	0.094	0.142
T_C	0.167	0.167	0.154	0.154	0.154	0.154	0.300	0.267	0.188	0.189

Data of the case company does not measure all economic indicators using common units. However, that is neither expected nor possible. To get rid of units, indicators normalization was performed using equation 4 and 5. In that way indicators became combinable and derivation of $(I_{E,t})$ was possible. Normalized results are presented in table 7.

Table 7: normalized indicators of the case company of year 2017

I	Indicator	Symbol	Weight	[January; June]	[July; December]
1	Orders reliability	O_R	0.163	0.997	0.994
2	Stocks reliability	S_R	0.082	0.982	0.986
3	Conception reactivity	C_R	0.076	0.792	0.789
4	Procurement reactivity	P_R	0.076	0.918	0.848
5	Production reactivity	P'_R	0.076	0.997	0.998
6	Reactivity of returned products	R_R	0.076	0.700	0.886
7	Orders flexibility	O_F	0.120	0.833	0.889
8	Quality of products/services	Q_P	0.142	0.996	0.996
9	Total cost of supply chain	T_C	0.189	0.667	0.571
				0.869	0.867

To calculate composite economic index $I_{E,t}$ during the year 2017, normalized value of each indicator was multiplied by its weight (equation 09).

Table 8: Values of composite economic index $I_{E,t}$

Period of the year 2017	[January; June]	[July; December]
$I_{E,t}$	0.869	0.867
$I_{E,t}$ (%)	86.94%	86.65%

4.2. Interpretation

Nine economic indicators were aggregated into a composite economic index $I_{E,t}$ for a studied company over the first and second half of year 2017 (Fig. 3). $I_{E,t}$ of this company reached the highest value in the first half of year 2017, but in the second half has been decreased slightly. Following these results, studied company is not on a truly economic path.

We can explain this decrease in economic performance between the first and second half of year 2017 mainly by increasing of company's total cost (Table 5).

Thus, decision maker of this company should identify (following this model) and improve weaknesses to keep economic performance constantly evolving.

Of course, to achieve 100% as economic performance is difficult, but improving this last between two consecutive periods is very requested.

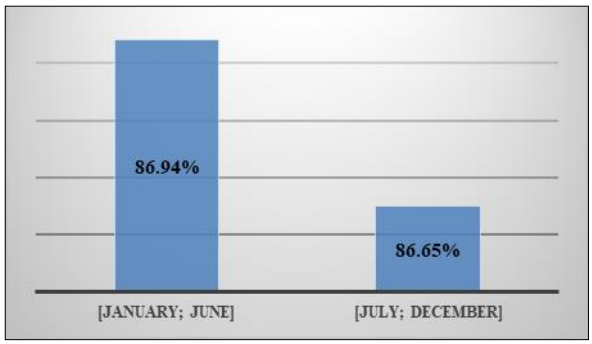

Fig 3: Economic performance variation of the studied company between the first and second half of year 2017

5. Results

Economic dimension is a fundamental axis in company, so measurement of economic performance of this last is very requested. So, by our composite economic index, we can get a simplified and quantified expression of company economic performance. This index (composite economic index), can be used to inform decision-makers about economic performance achieved throughout their companies, and then the determination of actions which should be applied. However, it may also be used to provide information to critical decision processes. IE,t helps us to improve economic performance and allow us to know where the best practices might be found (Haddach *et al*., 2016) [4]. Companies decision-makers could easily interpret this index, then finding the correct sense which they should react. If enclosed in the periodic economic report, IE,t could also be used to present the company progress to various parties interested in company economic performance. As IE,t would be applied to different companies, it would be possible to compare and rank them (companies) in terms of economic performance.

By this model, we provide for 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 such as the implementation of economic best practices. This analysis allows him to define the scope of activities and to consider several options for this end.
- To analyze the profile of the economic performance related to company decisions during the planning phase, choose the configuration of the company and the way to exploit it in advanced and optimized manner in order to

ensure target level of economic performance. This level of economic performance defines the strategy that the decision maker wishes to implement.
- To know precisely the additional investment in monetary terms, which he/she must engage to achieve the level of economic performance desired.
- To have quantitative performance indicators which used to control company and for purposes of communication.

6. Conclusion

Applying the principles of sustainable development in industrial management is still a difficult task. In this sense, companies have a very little knowledge and tools. Consulting firms are often helpless against the demands of companies that want to engage in CSR (Corporate social responsibility). 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, 2014). In the origin of this paper, was the problem of taking into account the economic dimension of company practices. In this context, our goal has been to provide an assessment model of economic issues. It was also for us, to assist in the definition of judicious and targeted axis of the progress allowing evolving evaluation systems of economic performance in company.

We proposed a model for economic decision in company. 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 economic indicators that will allow us to know our level in terms of economic performance.

Finally, we considered the realistic case of a company which is part of the Moroccan automotive industry and which served us the application framework for our mathematical model. To assure the reliability of this model, we considered core economic indicators during their construction. The model presented in this paper promises advance in economic performance assessment of companies and makes economic information more useful to decision-makers. Any company and based on this model, could know their achievements towards economy. Even though further development is called for, it is evident that this model has the potential to become very useful as one of available tools.

7. References

1. Bouquin H. Le contrôle de gestion. 2ème édition, Collection Que sais je, Paris, Presses Universitaire de France, 2004.
2. Dyer JS. Remarks on the analytic hierarchy process. Management Science. 1990; 36(3):249-258.
3. Ferguson R, Leistikow D. Search for the Best Financial Performance Measure: Basic are Better. Financial Analysts Journal. 1998; 54(1):81-86.
4. Haddach A, Ammari M, Ben allal L, Akharif A. Measuring Environmental Performance of Supply Chain. The International Journal of Engineering and Science. 2016a; 5(5):79-91.
5. Haddach A, Ammari M, Ben Allal L, Chraïbi L, Laglaoui A. An integrated methodology to assess social performance of supply chain. International Journal of Advanced Research. 2017a; 5(4):123-136.
6. Haddach A, Ammari M, Ben Allal L, Azaar K, Laglaoui A. How to meaure sustainability of supply chain. International Journal of Advanced Research. 2017c; 5(5):401-418.
7. Haddach A, Ammari M, Ben Allal L, Laglaoui A. Proposal of a module to measure economic performance of supply chain. IOSR Journal of Business and Management. 2016b; 18(6):87-96.
8. Haddach A, Ammari M, Ben Allal L. Measuring sustainability of best practices in logistics chains. Global Journal of Science Frontier Research: I Interdisciplinary. 2016c; 16(1):1.0.
9. Haddach A, Ben allal L, Ammari M. An overview of methodologies for evaluating global performance of supply chains. International Journal of Engineering Inventions. 2017d; 6(11):01-09.
10. Haddach A, Ben Allal L, Laglaoui A, Ammari M. Assessment of Firm's Global Performance: Available Tools and Proposal of a New Module. International Journal of Business and Management Invention. 2017b; 6(7):06-17.
11. Hafeez K, Zhang Y, Malak N. Determining key capabilities of a firm using analytic hierarchy process. International Journal of Production Economics. 2002; 76(1):39-51.
12. Heeramum K. Création et capitation de la valeur dans la supply chain: développement d'un outil d'aide à la décision. doctoral diss., CRET-LOG, Université Aix Marseille, 2003.
13. Ittner CD, Larcker DF. Innovation in Performance Measurement: Trends and Research Implications. Journal of Management Accounting Research. 1998; 10(2):205-238.
14. Knight JA. Value Based Management: Developing a Systematic Approach to Creating Shareholder Value. New York: McGraw-Hill, 1998.
15. Ming-Lang T, Ming KL, Wai-Peng W, Yi-Chun C, Yuanzhu, Z. A framework for evaluating the performance of sustainable service supplychain management under uncertainty. International Journal of Production Economics. 2018; 195:359-372.
16. Mohan R, Rishi C, Angappa G, Purnendu M. Improving competitiveness through performance evaluation using the APC model: A case in micro-irrigation. International Journal of Production Economics. 2018; 195:1-11.
17. Nanni AJ, Dixon RJ, Vollmann TE. Strategic Control and Performance Measurement. Journal of Cost Management. 1990; 4(1):33-42.
18. Otley D. Performance Management: A Framework for Management Control Systems Research. Management Accounting Research. 1999; 10(4):363-382.
19. Rappaport A. Creating Shareholder Value. First Ed., New York: The Free Press, 1986.
20. Rappaport A. Creating Shareholder Value. Second Ed., New York: The Free Press, 1998.
21. Richard AB. Recognition for Sustained Corporate Social Responsibility: Female Directors Make a Difference. Corporate Social Responsibility and Environmental Management. 2014; 23(1):27-36.
22. Roy B. Méthodologie multicritère d'aide à la décision.

Paris, Economica, 1985.
23. Saaty TL. Analytical Hierarchy Process: Planning, Priority Setting, Resource Allocation. NewYork, McGraw-Hill, 1980.
24. Simons R. Performance Measurement and Control Systems for Implementing Strategy. Upper Saddle River: Prentice-Hall, 1999.
25. Stewart GB. The Quest for Value: A Guide for Senior Managers. First Ed., New York: Harper Business, 1991.
26. Stewart GB. 1999. The Quest for Value. Second Ed., New York: Harper Business.