An approach based on balanced scorecard for the implementation of overall performance indicators of a supply chain Case Study of a Moroccan SMEs

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Abstract— A company's performance in its supply chain is apprehended through the satisfaction of a set of objectives inherent in the chosen strategy. These objectives are based on several horizons and this is called strategic, tactical and operational objectives. This involves the variation of the performance on these same three decision-making levels [4] and to assess the degree of achievement of each objective, a company then uses to measure its basic performance. For this, it relies on a set of performance indicators or indicators system.

This article discusses in the first part, the concept of measuring performance, a recent literature review and detailed indicators of major global supply chain and a summary of these indicators. To adapt these indicators to Moroccan companies, we conduct a case study where we propose an approach of building a global dashboard based on the concept of Balanced Scorecard.

Index Terms— Supply Chain, indicator, performance, system, BSC.

1 INTRODUCTION

Supply chains are a result, or rather a consequence of the wave of globalization and the globalization of markets. Indeed, in an environment of more increasingly competitive race to reduce production costs while maintaining a good quality of finished products and improving the quality of customer service, more demanding than ever, never ends. Companies and organizations now transcend borders become even more complex, and therefore new challenges to manage emerged.

One of the biggest challenges companies face today is the need to meet increased demands of customers in markets where competition from low-cost labor are becoming stronger and destabilizing.

To meet this challenge, industrial organizations are reorganized to offer differentiated products while improving their responsiveness and flexibility. To support its strategy, the company will then seek to identify performance indicators that will contribute to the achievement of its strategic objectives and on which it will be able to act. These performance indicators are typically attached to the product, the client, the resources of the business or organization. It is around these performance drivers that will organize any activity performance evaluation of the company.

In our article, we will make a summary of aggregate indicators of the supply chain. To do this, we will discuss the concept of performance measurement, to a recent literature review and detailed indicators of a major global supply chain and highlighted with a summary of indicators. The last part of this article will be devoted to a case study of a Moroccan company operating in the automotive sector, which aims to build a global dashboard based on the concept of Balanced Scorecard.

2 CONCEPT OF A SUPPLY CHAIN

The supply chain includes all transactions for the manufacture of a product or service from the extraction of raw materials to delivery to the end customer through the steps of processing, storage, and distribution. Nowadays, more and more we look at the supply chain as a canvas multi activities mentioned, this is due to the complexity of today's organizations and their international dimension. Added to the material flow, logistics chain includes information and financial flows. Each stage of processing or distribution may involve new actors or new suppliers or new customers intermediaries, also with new information flows [32].

2.1 Description

Many definitions have been proposed in the literature to explain the term "supply chain" and "supply chain", but not all approach this notion from the same angle of approach (CO-DRIVERS [8].

For [26], a supply chain is a network of organizations that contribute to different processes and activities through interactions upstream and downstream, adding value in the form of products and services for end customers. From a conceptual

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point of view, a supply chain can be considered as a succession of procurement process, manufacture, distribution and sale of a product, from the first supplier to the end customer.

In one of the most important books on supply chains and Meindil Chopra [9] give the following definition: "a supply chain consists of all stages involved directly or indirectly in the satisfaction of the request for a client. The supply chain not only includes the manufacturer and suppliers, but also transporters, retailers and customers themselves "storage centers. Zougar Amrani [1] proposes to incorporate these definitions in a single table (Tab.1).

TABLE.1
SOME DEFINITIONS OF SUPPLY CHAIN

Authors	Definition Chain Logistics CL	key Points	Discipline journal
Jones [22]	'The CL includes planning and management of the entire flow material from the supplier to the final customer through the producer and distributor '	Sterling flow material, Customer	Physical distribution and material management
(Ellram, [13]	''The CL is a network of companies interacting, interrelated by various flow from raw material supply to final delivery, and working to achieve product or of services for end users	Network, interactions, flows, customer	Physical distribution and logistics management
(Ganeshan [18]	The CL is a network facilitator performing the functions procurement of materials, transformation of these materials intermediate products and finished products, and distribution of products to customers	Network, Process Customer	Management science and information system
Christopher, [7]	'The CL includes strategic management process procurement, inventory movements of materials, components and finished products as well as information flows that are are associated. The organization of sales channels is such that current and future profitability is maximized through process of executing the command	Process organization performance execution order	Logistics and supply chain management
Hanfield [21]	'The CL includes all activities related to both the physical flow by converting well from the raw material stage to final client, that information flow'	activities, flows material and informational custome r	Physical distribution and logistics management
Chopra [9]	'The CL characterizes all activities impacting directly or indirectly in the sales order. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves' '	Steps embodiment of the control partners	Integrated supply chain
Mentzer [25]	'The CL is a group of at least three entities directly involved in the upstream and downstream flows of products, services, finance and / or information, ranging from a source to the customer '	Entities flow various, customer	Business logistics
(Fenièss, [15]	'The CL is a complex system described as: - An open set traversed by financial flows, materials and informational - A network of physical entities (factories, workshops, warehouses, distributors, wholesalers, retailers) and self-organization (Firms, subsidiaries, business units ...) - A set of activities grouped in a logistics process whose layout is a value chain and intra-organizational	Various streams, network varied activities inter and intra-organizational	Logistics and management

Each of the researchers that focuses on the study of supply chain provides a definition for the following discipline which it is derived and objectives that guide its analysis.

In conclusion we can see that there are two visions of the supply chain, one based on the company, and the second based on the product. Oriented product supply chains are based on the flow of material necessary for the development of a product or product family. Approaches considering the supply chain of a company consider the company as a central element, then all stakeholders with whom it interacts.

3. MEASURING PERFORMANCE OF A SUPPLY CHAIN:

3.1 Why measures of the supply chain?

Several factors explain why leaders need specific measures to manage the supply chain, including:

• The absence of measures that express the performance of the entire chain;

• The need to go beyond internal measures and cover the entire supply chain;

• The need to determine the interaction between the performance of each player and the chain as a whole;

• The complexity of the supply chain management;
• The need to align activities and share information about the performance to implement a strategy that achieves the objectives of the supply chain;
• The desire to enlarge the viewing angle within the supply chain;
• Willingness to distribute the positive and negative effects of functional changes in the supply chain
• The need to differentiate the supply chain to gain competitive advantage;
• The desire to promote cooperation between the functions in companies and among members of the supply chain [12].

3.2 Measuring Performance

Currently, performance is defined by multiple criteria, due to the enlargement of the notion of efficiency in triptych "efficiency - efficiency - effectiveness" and the evolution of the relationship between the industrial system and its environment.
So the performance becomes a kind of joint research:
- The efficiency of peripheral expanded production system activities;
- The effectiveness of the process used;
- The effectiveness of objectives, regardless of their relevance to the resources available. [3]
These objectives are based on several horizons and this is called strategic, tactical and operational objectives. This involves the variation of the performance on the same three levels of decision making [4] and to assess the degree of achievement of each objective, a company then uses to measure its basic performance. For this, it relies on a set of performance indicators or indicators system.
Lockamy [24] classifies them into two categories: qualitative performance measures (customer satisfaction, flexibility, integration of physical and information flows, financial risk management...) and quantitative (delivery delays, response time client,).
The performance evaluation by a system of performance indicators is a problem widely studied in the recent literature on the supply chain. The objective here is to improve the performance of the entire chain must implement "performance measures" to assess the effectiveness of a policy of supply chain management.

5. Indicator Systems Supply Chain

Depending on the degree of importance given to an indicator or group of indicators in the management system, they will be qualified performance indicators "key" (Key Performance Indicator). These are the predominant indicators in the monitoring and control of performance and require more attention from managers.

From this, the indicator can be defined as information to help a "decision maker", individual or collective, more generally, to drive the course of action to achieve a goal or to allow it to 'evaluate the results. [17]

The indicator is seen as "an objectified measure" [5], a decision element to or control processes to achieve defined objectives (control logic) or modify the objectives themselves (logical progress) [27].

The objectives of the company are numerous and declining in three managerial dimensions, a significant number of indicators is required. This is called system of indicators is a "set of indicators, necessary and sufficient for the actions envisaged defined in accordance with the set of all the objectives of the system under consideration" [4] Far from being independent, these indicators are interrelated and this is the consideration and the simultaneous analysis of all these indicators used to evaluate the consistency and performance of a supply chain.

The link most commonly cited is that of subordination when measured by an indicator at a given level performance that contributes to the higher level. The lower indicator is considered to be an evaluation of local performance and acts as a variable action vis-à-vis the higher level indicator, considered overall. The overall performance of the company is then expressed by indicators that reflect its financial performance and competitiveness [16]. These indicators are at the strategic level and are related to Key Success Factors identified by the company. The local performance is influencing factors or determinants of overall performance and is expressed as process indicators. These process indicators are associated with Performance Factors when they are at the tactical level and Factors of Progress for the operational level.

6. Global Indicators Cited in the Literature:

We start with the SCOR (Supply Chain Operations Reference model) which is a qualitative model based on a benchmarking modeling of the supply chain, born in 1996 in the industrial group 69 which formed the Supply Chain Council [29]. This reference model consists of four levels describes the key processes present in each company in the supply chain, offers a number of performance indicators for each of the process, describes best practices associated with each element of the process and identifies commercial software to implement them.

Fig.1. SCOR Model with its processes, from CSC [29]

The SCOR model provides performance indicators, but does not specify if they are independent and consistent. In addition, it provides no method to deploy a more detailed level (disaggregated indicators). The key performance indicators recommended by SCOR are given in the table (Tab.2):

TABLE.2
EXAMPLE OF PERFORMANCE INDICATORS OF THE SUPPLY CHAIN

Activity / Process	Level Strategic	Level Tactical	Operational Level
Planning	Level of perceived value of the product by the customer, variances against budget, control time, cost of information processing, net profit ratio Vs productivity, total cycle time, total time cash flow, time product development cycle	Time client request, cycle time of development, reliability forecasting techniques, cycle time of the planning process, methods of receiving orders, human resources productivity	Method for receiving orders, human resources productivity.
Procurement		Delivery performance of suppliers, response time of suppliers relative to industry standards, supplier price compared to the market price, efficiency of the cycle time of purchase orders, efficiency of the method cache flow	Efficiency of the cycle time of purchase orders, supplier price compared to market price
Production	Portfolio of products / services	Scrap percentage, by cost fortune to work, capacity utilization, use of economic quantities	Percentage of waste cost happiness by working productivity index of human resources
Shipping	Flexibility of service system to meet customer needs, efficiency of the distribution plan of the company	Flexibility of service system to meet customer needs, efficiency of the distribution plan of the company, effective billing methods, percentage of finished products in the network, reliable delivery performance	Quality of products delivered, percentage of products delivered on time, efficient billing methods, number of delivery invoices without mistakes, percentage of urgent deliveries wealth of information necessary to make deliveries, reliable delivery performance

These indicators are then used to drive the performance of planning, purchasing, procurement, production, delivery, sales [20]. [19]. [6]. According to the considered process, we speak of internal indicators or external indicators and they are oriented or customer-oriented suppliers.

Based on the work of [19],[29], [20],[2]. Sahin [28], [31], [11].Anne-France [14] provides a summary of indicators often cited in the literature to measure the performance of a supply chain (Figure 2).

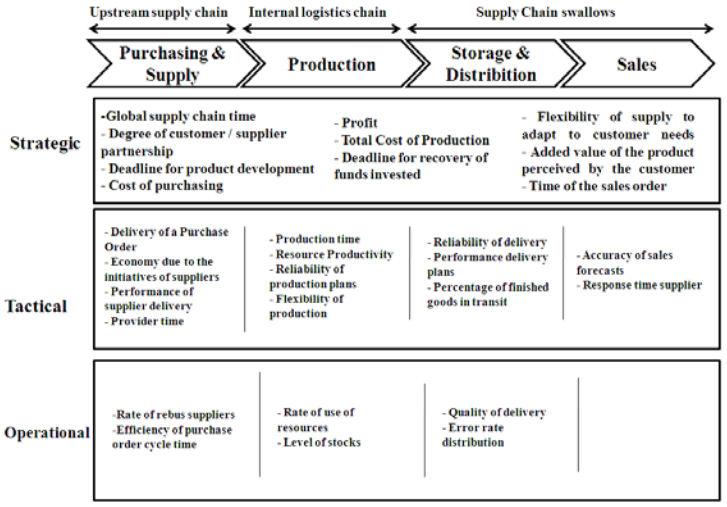

Fig.2. Main business performance indicators

Meanwhile, Julien François [23] identifies three aggregate indicators of a supply chain:

- The degree of partnership

Varying degrees of agreement between partners in a supply chain can be highlighted. Lauras et al. (2003) distinguish between "communication", "coordination", "cooperation" and "collaboration." These different degrees of partnership depend on two factors:

- The type of information or treatment (resolution of part or all of a problem) pooled by partners
- How to exchange or share information between the two partners.

- Cost reduction

Reducing costs throughout the chain is a key priority of supply chains. Reducing the overall costs to reduce the price of finished products and so seek to acquire market share and generate profits for future investments in the supply chain.

- Reduction of delivery

A company must react quickly respond to market changes in order to make profits. Thus, the main objective of Caterpillar [10] was it to produce and deliver products to customers in three weeks in 2006 against eight weeks in 2000, and to reduce the processing time of orders (entry, calculation ROs, ...) to one week against eight weeks in 2000 (Figure 3).

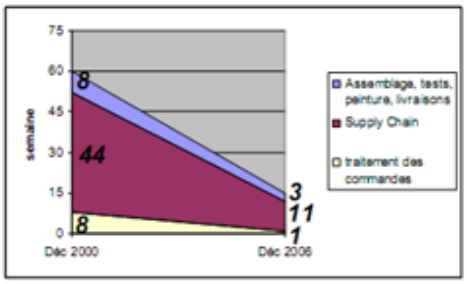

Fig.3. Objective of reducing delays at Caterpillar from Dany[10]

For global optimization of the supply chain, we must find a balance between financial and non-financial metrics whether strategic, tactical or operational level. Also, to make the right steps in all functions of the chain would better understand and thus can improve it where the need arises.

In this sense, Meindil and Chopra [9] identified six indicators of overall performance (Table 3):

TABLE .3
THE SIX PERFORMANCE INDICATORS ACCORDING TO CHOPRA [9]

Indicators	Definitions
Infrastructure	Physical locations where the products are stored, assembled, or manufactured. Decisions about their roles, location, capacity and flexibility (technology) influence the performance of the supply chain.
Stocks	Includes all stocks of raw matter eras, assets, and finished goods. Change policies stocks influence the reactivity of the chain logistics.
Transportation	Also including internal transport of stocks of finished or semi.
The information	It is constituted killed data on infrastructure, inventory, transportation, costs, prices, customers. It may be the major indicator performance of the supply chain for the performance of this function directly affects all other indicators.
Sourcing	It is a question of who should carry out an activity through the chain such as production, storage or transport. At the strategic level, it is to determine what activities the company will do itself and what activities it will subcontract.
Prices	It is a question of giving value and price of goods and services supply chain product. Prices influence the behavior of customers and the chain performance.
Transport policy	A combination of choice of transport modes and setting delivery schedules. The performance of the transport function of the responsiveness and efficiency of the chain is especially important for most companies transport costs represent a third of the overall costs.

While Gunasekaran [19] identified six key indicators for which they develop metrics (Tab.4).

TABLE.4
THE SIX INDICATORS ACCORDING GUNASEKARAN [19]

Metrics	Indicators	Definitions
Metrics planning controls	The method of receiving orders	This method determines how the customer specifications are converted into data exchanged throughout the chain.
	Latency command (order lead time)	Total control cycle is elapsed time from receipt of order to delivery of product to the customer. The shorter the cycle induces a better system response to customer orders which gives it an advantage in terms of competitiveness.
	The path of the command	It includes all the channels through which the command is past. This indicator identifies the steps where there was no added value, and allows the chain to make the decisions necessary to eliminate the steps without added values.
Evaluation of suppliers	The supplier evaluation involves action at all levels of the chain.	This assessment was often based on changes in prices and on time delivery. Competition between suppliers was a competition based on prices offered neglecting other equally important aspects such as quality, responsiveness, availability and customer satisfaction. This analysis provider must be made periodically and projected on the long term.
The metrics in production	The range of products and / or services offered and produced.	
	Production capacity	His role is important because it determines the activity levels throughout the chain. It directly influences the speed of response to commands (reactivity of the chain) and the cycle time of a product in the chain.
	Efficiency scheduling techniques	Determines the manner in which the resources are allocated to tasks.
Evaluation of deliveries	The performance of this function largely determines whether or not the customer satisfaction, and thus the competitiveness of the system.	
Assessment of quality of service	The pliancy	Capacity of the supply chain to respond favorably to requests from individual customers. Flexibility can be measured by the cycle time of product development and time setting machines or tools.
	Time response customer queries regarding for example monitoring the status of their orders.	
	Quality after-sales service	
Evaluat	It is the assessment of all costs related to logistics. This	

ion of Logistic Costs	is a very important financial indicator; financial flows have a large influence on the flow of products. One of the indicators is to measure the cost of the risks undertaken by the chain.

For classification, Taylor [30] classifies the performance indicators of the supply chain into four categories:

- Measurement time: including among others, the cycle time of an order, the cycle time of product development, timely deliveries.
- Measures of costs: including among others the costs of raw materials, payroll, maintenance, defective product returns, transport, storage, and management of infrastructure.
- Measures of Effectiveness: concerns the utilization of a property chain as the utilization of storage facilities, the rate of capacity used, and the rate of capital used.
- Measures of quality of service: as the rate of deliveries on time, satisfied the orders, returns factory, customer complaints, and customers who spend new orders.

7. SUMMARY

At the end of this state of the art of global indicators in the supply chain, we synthesize them and we classifying according to the four pillars of the Balanced Scorecard (BSC) (Tab 5).

TABLE 5
GLOBAL INDICATORS BY BSC

Axis	Indicators	Explanation
Financial	Prices	It comes to value and price the goods and services supply chain product.
	Evaluation of logistics costs	It is the assessment of all costs related to logistics.
	Reduction costs	
	Infrastructure	Physical locations w here the products are stored, assembled, or manufactured.
Customer	Evaluation of deliveries	The performance of this function largely determines whether or not the customer satisfaction, and thus the competitiveness of the system.
	flexibility	Capacity of the supply chain to respond favorably to requests from individual customers.
	Quality after-sales service	
	Time response customer queries regarding	Such as monitoring of the status of their orders.
	The method of receiving orders	
Internal processes	Latency command (order lead time)	Total control cycle is the time from receipt of order to delivery of product to the customer.
	Reduction of delivery	
	The degree of partnership	
	The path of the command	It includes all the channels through which the control happened.
	Evaluation of suppliers	This assessment was often based on changes in prices and on time delivery.
	The range of products and / or services offered and produced.	
	The production capacity	His role is important because it determines the activity levels throughout the chain.
	Effectiveness of scheduling techniques	Determines the manner in which the resources are allocated to tasks.
	Transport policy	A combination of choice of transport modes and setting delivery schedules
	Sourcing	It is a question of who should carry out an activity through the chain such as production, storage or transport.
	The information	It is constituted data on infrastructure, inventory, transportation, costs, prices, customers.
	Transportation	also including internal transport of stocks of finished or semi
	Stocks	Includes all stocks of raw matter eras, assets, and finished goods.
Axis organizational learning	Employee satisfaction index Absenteeism Evolution education levels Case number by Commercial	

8. CASE STUDY (MAKING A GLOBAL DASHBOARD)

From the analysis of the existing indicators in terms of global supply chain, we will try to adapt to the case of a Moroccan company that operates in the field of automobile distribution.

The design scheme that we propose to build a Global Dashboard follow the methodological approach based on the principle of Balanced Scorecard (Figure 4):

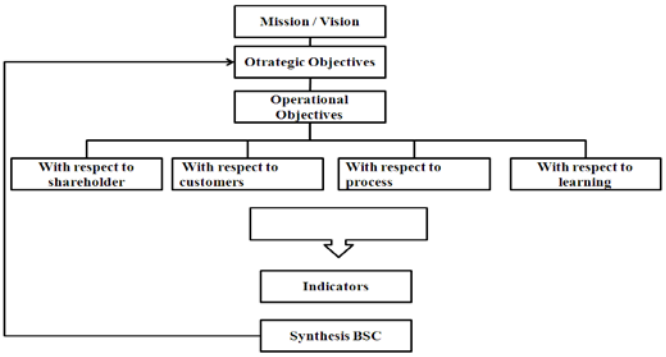

Fig.4. Steps of designing a BSC

Our approach to building is divided into three phases which are linked as follows:

A. Phase 1: Establishing the vision and strategic direction

The mission, vision and strategy is our starting point for the development of balanced scorecard of the organization.

a Mission and vision

The company is currently organized around three business lines:

- Pole distribution of vehicles and spare parts (passenger cars and new vehicles);
- Pole mounting heavy weight commercial vehicles;
- Pole after sales service.

Branch of the company says its intention and fundamental vocation based on the following aspirations:

- Consolidate a leader among luxury brands;
- Have a distribution network covering major cities of the country;
- To provide our customers the best product in terms quality / reliability and quality after sales service;
- Supporting our customers for the life of their vehicle, and beyond.

b Srategic and operational objectives

Strategic Objectives

Strategic objectives revolve around three main axes:

- Maintaining a dominant position in the high end by improving customer service;
- Develop and improve market share in both segments vehicle owner (VP) and utility vehicle (LCV) in the medium and low-end through a policy of aggressive marketing and communication on the Casablanca-Rabat axis;
- Maintain a high level of quality in order to retain customers increasingly demanding and face a very aggressive competition by focusing on the development of the After Sales Service.

Operational objectives perspective

The aim here is to define the objectives of the company with respect to four key areas: finance, customers, internal processes and organizational learning.

These multidimensional objectives are:

A.1 Financial perspective

Thinking about business strategy led to identify three financial goals:

TABLE 6
FINANCIAL GOALS

Financial goals	Description
OF1- Increase our leadership	**More specifically, the objective is defined as follows: "accelerate growth by improving the rate of customer loyalty and developing offers new models of vehicles and after sales services. Develop an image of luxury automobile company with a leading position in undisputed market share in the various trades "**
OF2- Generate more cash flow	**The increase in cash flow concerns at once choice and rationalizing investment, reducing settlement times and inventory control.**
OF3- Increase profitability	**Profitability the overall e is sought by business line (Sales new vehicles, spare parts, after sales service), and also the development of vehicle segments with high added value.**

A.2 Customer perspective

For this axis, the objectives of the Management Board are defined by separating the VU and VP activity, and identifying different target customer (Customers trucks, network and dealers, private client).

TABLE 7
CLIENT OBJECTIVES

Objectives customers	Description
OC1-Increased satisfaction different customer segments	**For the sector vehicles utilities, waiting Principal vis-à-vis a partner is to ensure a high quality of service. The offer must be personalized and create added value for customers (trucks and their entourage of transport).**
OC2- Increase in market share	**For this target, the risk is low, given the trade policy (ceiling, bank guarantee, accounting for vehicles new).**

A.3 Internal process perspective

Based on the objectives of the financial perspective (shareholders) and customers, we will define the levers in terms of internal processes (part of which is shown in the table 8).

TABLE 8
INTERNAL PROCESS OBJECTIVES

Objectives Internal Process	Description
OP1- Extend the range of products and service	**This process enters the phase of innovation imported models and services, the objective are to reach the expectation of every type of guest.**
OP2- Place our price	**Provide services packages,**

revisions OP3- channel development distribution OP4- development services after sales	**profitability analysis of the maintenance contract commercial vehicles, price repositioning vehicles.** **This process affects the visibility and brand presence in accordance with the standards of the seat.** **Implement scheduling systems to meet deadlines promised. Mobile workshop system to assist client's offsite.**

A.4 Organizational learning perspective

We will define in this context (which forms the basis of the control system by the BSC) three areas playing a strategic role in the company: the level of satisfaction and competence of staff, features and the performance of system information and quality management system.

TABLE 9
OBJECTIVES ORGANIZATIONAL LEARNING

Objectives organizational learning	Description
OO1- Develop skills managerial and commercial	**This objective is linked to the definition of skills, attraction and talent development.**
OO2- To work tools forecasting and operational management simple and reliable	**The objective of this organizational perspective relates meanwhile IT tools deemed too complicated and unreliable or partially used by operational.**
OO3- Establish a system the management by objective	**It is an incentive to short result and long-term average**

B. Phase2: choice of relevant indicators perspective

Based on the synthesis of global indicators and objectives defined by the four axes Scorecard, we set the table (10).

TABLE 10
CHOICE RELEVANT INDICATORS PERSPECTIVE

Axes	Objectives	Global indicators
Financial	- Increase our leadership - Generate more cash flow - Increase profitability	- Sales Growth - Net cash flow - Gross profit
Customer	- Increased satisfaction of different customer segments -Increase market share	- Flexibility -The response time to customer requests for
Internal process	- Extend the range of products and service - Place our price revisions - Development of distribution channels: - Development of after sales services	- The quality of after sales service - The range of products and / or services offered and produced. - Transport policy - Prices
Organizational learning	- Develop managerial skills and business - To work tools and operational management planning simple and reliable - Establish a system of management by objective	- Employee satisfaction index - Absenteeism - Changes in the levels of education - Turnover by business

C. Phase 3 Summary of BSC

Structure Scorecard business study highlights five areas, namely: the objectives of the society perspective, indicators related to these objectives, performance targets and actual performance

TABLE 11
GLOBAL DASHBOARD

Axis	Indicators overall	Target Performance	Real performance
financial	- Sales Growth	1 0% of year kdh	
	- Net cash flow		
	- Gross profit		
customer	- Flexibility	90%	X%
	- The response time to customer requests for	2d	Xj
internal process	- The quality of after sales service	90%	X%
	- The range of products	2	2
	- Transport policy		
	- Prices		
Organizational learning	- Rate of absenteeism	2%	3%
	- Changes in the levels of instruction	90% + vat	80% + vat
	Turnover by business		

	-Employee satisfaction index	80% of employees give the two best ratings	X% of employees give the two best ratings

9. CONCLUSION:

There are a multitude of performance indicators of the supply chain. Take too many indicators can generate a large amount of data they would be difficult to manage and does not give enough visibility on what should be the decisions that must be taken to improve the quality of the supply chain. However, take some indicators could have adverse consequences because we might overlook some important factors. The challenge is to take the "good" indicators.

To meet this challenge, this paper proposes a state of the art and analysis of the existing in terms of aggregate indicators of supply chain performance measurement. It helps to have an overall view on the subject and it will be used as the basis and inspiration track to achieve a new type of aggregate indicators of the supply chain.

Based on this work and to adapt these to Moroccan companies, we conducted a case study of a company operating in the automotive sector, where we proposed a process for producing a Scorecard (BSC), which led us to meet the objectives of the company according to the four axes of the BSC. Finally, we have a successful global dashboard based on relevant global indicators meet business objectives.

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