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Supply Chain Performance Evaluation Models, State-of-the-Art and Future Directions

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Abstract: ***Continuous improvement in supply chain performance creates value not only for businesses, but also for customers and suppliers who interact in different levels. Given the criticality of supply chain management, companies use different maturity models to measure their performance. Currently, there are many performance evaluations models and the choice of the appropriate model for the company depends on several criteria. This work presents a review of all supply chain performance evaluation models and highlights the characteristics and constraints of the implementation of each supply chain performance evaluation models. This work will provide a good guideline to managers to choose the appropriate model for their organization.***

Keywords: supply chain performance evaluation models, global supply chain, benchmarking, Performance measurement system.

I. INTRODUCTION

The globalization and liberation of commerce intensify the competitiveness among all companies in the world. As a result, all companies and organizations aim to do be more competitive and enhance overall performance. Therefore, the organizations must elaborate a good supply chain performance evaluation models, which can be defined as the process by which the company manages its supply chain performance in line with functional strategies and objectives. In some views, we can define supply chain performance evaluation models as a system composed of key performance indicators (KPIs) in order to measure the effectiveness and efficiency of an operations in order to achieve performance levels desired by company strategy. The supply chain performance evaluation models must have the three components i) The model must be based on company strategy ii) The KPIs must be SMART (Specific, Measurable, Achievable, Relevant, Time-bound) iii) The model must have objective related to company strategy. Moreover, it's essential to integrate information technology to improve supply chain performance. Also we can rely on the five basic elements of a performance measurement systems: people, procedures, data, software, and hardware [1].

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Many researches aims to enhance the performance evaluation with the purpose of achieving the maturity of systems [2,3]. The maturity model is based on a specific process that must be respected to achieve the level of excellence corresponding to the best level of maturity.

However, the actual supply chain performance evaluation models must be adapted to the fourth industrial revolution. To reach the industry 4.0 maturity, the actual models must take into consideration: i) the complexity of the whole connected supply chain. [4,5] ii) The agility and the responsivity of new organizations.

The paper is structured as follows. Section 2 summarizes the different supply chain performance evaluation models applied in different areas, followed by section 3 where we compare different models according to different criteria. Section 4 encompasses all existing hybrid models to make it easier for companies to choose what they need. Section 5 discusses and analyzes the result of our review. Finally, in section 6 we conclude about the strengths and the limitations of the contribution.

II. LITERATURE REVIEW

In the last fifty years, many academics and practitioners have been contributing to the development of models related to supply chain performance evaluation applied in different areas. This section summarizes the most published models.

A. ABC Activity-Based Costing:

Activity-Based Costing was established in the 1980s by Harvard Business School. The ABC method is used for cost and margin analysis. This method requires a depth mastery of the company. The implementation of the ABC method is based on five steps [6] : i)Mapping processes by identifying the company's activities and different products ii) Allocation of all workloads and working times to activities. iii) Definition of a system of performance indicators measuring the production of cost-generating activity. iv) Identifying the amount of resources consumed per product and thus the associated costs. v) Determining the cost of the product detailed by activity.

B. BSC (The balanced scorecard):

The balanced scorecard was developed by Kaplan and Norton in 1992, to measure the company's performance, using a combination between financial and non-financial measures. This method is based on four pillars of analysis: i) Customers, (ii) Finance, iii) Internal processes, iv) Innovation and growth. This method focuses on the strategy of the general management and incorporates a human dimension for performance measurement.

C. GSCF (Global Supply Chain Forum):

Global Supply Chain Forum was developed by [7], to describe all the standards of supply chain processes. This model focuses on three elements[7] [8]: i) Structure of the supply chain network, ii) Supply chain management components and iii) Supply chain management processes. In fact, supply chain management through the GSCF model is based on eight key processes: i) Customer Relationship Management Process [7].ii) Customer service management process[9] . iii) Demand management process [10]. Iv) Process of executing orders. v) Process for managing manufacturing flows[11], vi) Process of managing the supplier relationship [7]. vii) Process of product development and marketing [12] and viii) Return management process [13].

D. SCOR (Supply Chain Operation Reference model):

Supply Chain Operation Reference model was developed and endorsed by Supply Chain Council (SCC) in 1996. SCOR is based in six pillars i) plan ii) source iii) make iv) deliver v) return vi) enable. This model can be applied to all type of companies. The SCOR model contains more than 150 key performance indicators that measure the performance of supply chain operations. These performance indicators are derived from the experience and contribution of board members [14].

E. ECR :(Efficient Customer Response)

Efficient Customer Response was founded in 1994 by a consulting firm Kurt Salmon Associates. It has been considered as a strong tool for optimizing supply chain performance through the evaluation of good inter-organizational practices. This model has three main objectives: enhance customer service, increase revenue and reducing costs. To achieve these goals, ECR is based on 45 criteria organized in four areas: i) Consumption and demand management, ii) Supply chain management, iii) Technology platforms and iv) Integration.

F. FLR (Framework for Logistics Research):

Framework for Logistics Research was developed in the 1990s. This model is used to describe dependence between: the level of the company's performance, the organization of logistics and the competitiveness. It can be applied to the organizational and strategic level by dividing the supply chain structure to four dimensions: Centralization ii) Formalization iii) Integration iv) Control.

G. ASLOG audit (Association for Logistics Audit):

ASLOG audit was created in 1997 by ASLOG is based on models used in the automotive sector. This model is a tool transversely, which aims to improve the level of excellence of the enterprise, through the implementation of best practices of logistics in the this areas : i) management, ii) strategy and planning, iii) design and projects, iv) procurement v) production, vi) transport, vii) inventory, ii) sales ix) returns and after the sale. x) steering and the indicator of progress is permanent.

H. SASC (Strategic Audit Supply Chain):

Strategic Audit Supply Chain was created in 1999. It analyzes the process of logistics. This model is applied at the organizational level to link the skills to the information technology and the organization of the supply chain. This method is based on six pillars of supply chain: i) customer orientation (ii) distribution, iii) sales planning, iv) lean production, v) partnerships with suppliers, vi) integration of management in the chain and link the skills technology and the organization of the information chain.

I. Global EVALOG (Global MMOG\/LE):

The Global EVALOG was founded in 1999 by Odette International Limited and Automobile Industry Action Group. This model aims to improve the logistics performance of companies through a continuous improvement process. Although it has been created for the automotive industry, it can be used for the sectors (metal products, chemicals). It is structured in six areas: i) strategy and improvement ii) organization iii) capacity and production plan iv) customers relationship v) mastery process / product vi) relationship with suppliers.

J. WCL (World Class Logistics):

The World Class Logistics was established in 1990 by Michigan State University. This model is used to assess the company's logistics performance through a 68-question. The WCL model focuses on four axes of competence: i) positioning, ii) integration, iii) agility and iv) performance measurement. It can be applied to the strategic and organizational level.

A. AFNOR FDX50-605*:*

AFNOR FDX50-605 was developed in 2008 by AFNOR. This standard defines the different logistics processes and also defines the performance levers associated with each process. This model proposes a process for implementing a logistics performance measurement system, based on the company's strategy, which is itself broken down into logistic objectives. These objectives are achieved through the choice of levers of action and is measured through key performance indicators.

K. SCM\/SME (Supply Chain Management/Small and Medium-Sized Enterprises)

Supply Chain Management/Small and Medium-Sized Enterprises was developed in 2007 in the context of SMEs. It consists of a questionnaire of 25 modules. The SCM\/SME repository is mainly dedicated to industrial SMEs in the consumer goods sector. It allows taking stock of the strengths and weaknesses of logistics practices and to situate the level of maturity of the company on a scale of 0 to 4.

L. EFQM Excellence model (European Foundation for Quality Management Excellence model):

European Foundation for Quality Management Excellence model was introduced in 1992.

This model is suitable for all types of businesses and allows the company to place itself on a scale of excellence through a questionnaire of 50 questions. The EFQM Excellence model have eight fundamentals concepts i) adding value for costumers, ii) creating sustainable future iii) developing organizational capability iv) harnessing creativity and innovation v) leading with vision, inspiration and integrity vi) managing with agility vii) succeeding through the talent of people viii) sustaining outstanding results.

This model is suitable for all types of businesses.

M. SCALE (Supply Chain Advisor Level Rating):

SCALE was created in the early 2000s by the Institute for Supply Chain Excellence. The SCALE model is dedicated to all types of industries by assessment the elements of value creation at the strategic and tactical level. It is based on a questionnaire that includes 58 processes categorized into seven groups: i) strategic objectives, ii) implementation of procedures iii) planning iv) coordination vi) evaluation of performance and tracking vii) supply chain optimization. This model is dedicated to all types of industries.

N. SPM (Strategic Profit Model):

SPM was created in 2002. It relies on financial ratios to analyze the interactions between strategic and operational levels. This model is based on cost factors and measures of net worth or on the return on assets for strategic and financial implementation.

O. CPFR (Collaborative Planning, forecasting, and Replenishment):

CPFR was created in 1998 by Voluntary Interindustry Commerce Solutions (VICS). It promotes collaborative planning by providing insight into planning, forecasting, and replenishment processes. CPFR model identify measures of collaborative practices appropriate to a specific process.

P. St. Gallen Management Model:

It was created in 1968 by Ulrich. This model focuses on the distinct phases of business development. The St. Gallen Management model looks at the evolution of management at three levels (operational, strategic, normative), thus combining them with the requirements of successful management. [15]

Q. VCOR (The Value Chain Operational Reference):

The Value Chain Operational Reference was founded in 2008 by the Value Chain group. This model is a three-tiered reference that defines interactions between internal and external partners in the service network. VCOR defines semantics and information that is shared as part of a collaboration, but at a general level. The impact of external support services and their integration is not taken into account in VCOR.

R. ARIS (Architecture of Integrated Information Systems):

Architecture of Integrated Information Systems was founded in 1994, by the software company IDS Prof. This model aims to have a comprehensive view of the processes of managing workflows and the processing applications. It aims to break down the company from an individual point of view in order to IEM (Integrated Enterprise Modelling): is a business process modeling method developed at the Fraunhofer Institute for Production and Design Systems Integrated Enterprise Modelling technology is a methodical for modeling the relevant business aspects [16]. It uses object-oriented modeling technology for business process modeling, related organizational structures, and necessary information systems.

S. Y-CIM Reference Model

Y-CIM was developed by Scheer in 1980 [17]1994). This model considered the standard industry model for the implementation of computer Integrated Manufacturing (CIM). The model approach aims to integrated the supply- chain and information technology support. The approach based in development of supply chain process and information technology process. The model is based into four pillars i) information and coordination process ii) financial accounting iii) cost and income accounting/controlling iv) information management

T. Aachener PPS reference model (production planning and control system reference model)

Aachener PPS reference model was Developed by Scheer in 1980 [18].This model give recommendation for the organization in order to enhance the procedure in the company. It consists of four different points of view: i) task ii) process iii) functional iv) data l. This model has been developed for four types of procedural order [19]. – i) contract manufacturers, ii) global contract manufacturers, iii) variants of warehouse manufacturers iv) manufacturers.

U. SMART (Strategic Measurement Analysis and Technical Reporting)

Strategic Measurement Analysis and Technical Reporting was developed in Wang Laboratories Inc in 1989 by Cross and Lynch. It Aims to: i) integrate financial and non-financial reporting, ii) link operational performance measures to strategy, iii) put the measurement system's focus on customer satisfaction and company objectives. This model proposes to decline the company's objectives around four organizational levels: i) company, ii) business units, iii) business operating systems and iv) departments and work centers [20].

V. PPMS (Process Performance Measurement System)

Process Performance Measurement System was created in 1996 by Friborg University (Switzerland). It is a model that proposes to measure the company's performance along five lines: i) financial, ii) innovation, customer, iii)

social and iv) employee. In general, a PPMS can be seen as an information system that supports process players to sustainably improve the company's competitiveness. Deduce complexity and gain a better understanding of the company with its different areas of interest.

W. ECOGRAI

ECOGRAI was created in 1990 Bitton [21] in GRAI Laboratory (Integrated Automation Research Group). This model relies on a top-down analysis of the organization to break down strategic objectives into tactical and operational objectives, with a participatory approach that involves future users in defining indicators at all levels [22].(KAANIT, MOUSS, and MOUSS, n.d.)The ECOGRAI method is based on the triplet objectives : measurement, variable in order to design and implement in all decision-making centers. The system of performance indicators focused on economic evaluation and consistent with the tree of objectives [23].

X. Functionality Economy (FE)

Functionality Economy was developed in the 80s by Walter Stahel[24]. It is an operational business model that affirms its contribution to sustainable development [25]. It highlights how to sell the use of a good rather than the property itself [26], the thing that can lead to a reduction in the consumption of raw materials and energy, creating the highest possible use value for as long as possible [27]. This economic model will be integrated as a driver of economic growth for years to come.

Y. Industrial Ecology (IE)

Industrial Ecology was created in 1989 by the journal "Scientific American". It is a model that promotes a service-level innovation trajectory that contributes to the implementation and sustainability of [25]projects. The definition of this model has evolved over time. In fact, there are the original definitions that have focused instead on reducing polluting emissions through their reuse in a production process. Also, there are the most recent definitions that take into account the synergies of mutualization of flows

III. COMPARATIVE TABLES OF THE CHAIN'S DIFFERENT MATURITY MODELS.

The different models treated have several points of divergence according to different criteria, for ordained goods we classified existing maturity models in table 1 according to different criteria as follows:

between companies in terms of supply or recycling [28].

- Creation date and creator: it means when and how to create the model.
- Number of version: it concerns the number and name of the other version of the same model.
- Flow type: it concerns which type of flow is used by the model (physical, informational and financial).
- Place of appearance: it concerns the context how to create the model if it is academic or industrial or a fusion between academic and industrial.
- Type of performance indicators: it helps to know which indicators are used by the model if there are common or specific indicators or the model uses only benchmarking.
- Decision level concerns time horizon of decision-making and hierarchical level used during the application of the model: i) strategic level concerns long-term and resource management, ii) tactical level concerns medium-term and resource planning and iii) operational level concerns short-term and operational flows piloting decisions
- type of organization: It means which context and which type of organization typology that can use the model if it is Intra-Organizational, Inter-Organizational, Extended Inter-Organizational or Multi-chain.
- Activity area concerns the sector of activity that can use the model if it is industrial or services or both of them.
- Benchmarking type: it concerns a comparison of products, processes and services of the similar company characteristics. The benchmarking can be internal or external.: i) Internal benchmarking: it means comparing and analyzing concepts, methods, products, services and processes within one organization. ii) External benchmarking: it involves benchmarking between different companies.
- Application constraints: it concerns the constraints that can limit the application of the model

IV. HYBRIDIZATION

Every model from the different models treated have its own strengths and weaknesses, that's why researchers have thought to hybrid same models with others, in order to minimize their weaknesses and benefit from their strengths. This section presents in table 2 the review of the existing hybridization in literature.

Table 1: Classification of models according to different criteria

Nbr	Model name	Creation date and creator	Number of versions	Flow type	Place of appearance (Academic or industrial)	Type of performance indicators	Decision level (stra_oper a_ tacti)	Type of organization	Activity area	Benchm-arking type	Application constraints
1	ABC: Activity-Based Costing	Founded in 1980 by Harvard Business School	i) TDABC (time-riven activity-based costing). [29,30] ii)ABM (Activity Based Management) [31] iii) ABB (Activity Based Budgeting)[32] iv) Activity-based techniques (ABTs) [33]	Financial	Academic	Financial indicators using internal benchmarking	Tactical	Intra-Organizational & Inter-Organizational	All sectors of activity	Internal	It requires more time and costs It is based on subjective information (acquired by the employees) It must be regularly updated [34]
2	BSC: Balanced Score Card0	Founded in 1992 by Robert Kaplan and David Norton	BSC (Balanced Score Card) SSC (Sustainability Scorecard)	Informational & financial	Academic	Indicators chosen according to the objectives of the company	Strategic	Intra-Organizational & Societal	All sectors of activity	Internal	Must establish linkages between performance measures, business strategy and organizational decisions [35]
3	GSCF framework	Created in 1997 by Cooper in 1997 Ohio State University	GSCF 2001 [7]	Computing , physical & financial([36,37]	Academic	internal benchmarking	Strategic, Tactical & operational	Intra-Organizational & Inter-Organizational	All sectors of activity	Internal	The following components are not operationalized in the GSCF model: Management Methods, Power and Leadership Structure, Risk and Compensation Structure, and Culture and Attitude. [38]
4	APICS	Created in 1957 by Ohio[39]	One version	Physical & informational	Academic	Indicators chosen according to the objectives of the company	Strategic, Tactical & operational	Intra-Organizational	Industrial	Internal	Continuous improvement of knowledge and skills in professional development areas and activities is required to maintain certification
5	ECR Efficient Customer Response: Supply Network Capability	Created in 1994 by ECR association of manufacturers and retailers ECR	i) Modele ECR-USA model ii) ECR-Europe model	Physical & computing	Industrial	set of 13 Performance Measurement Indicators for cross-sector comparison	Strategic & Tactical	Intra-Organizational & Inter-organizational	Industrial	Internal & external	There are researchers such as [40,41] [42] who are unconfirmed by the innovative nature of RCTs. Both researchers consider the ECR model as "old wine in new bottles."
6	FLR: Framework for Logistics Research	Created in the 1990s[43]	One version	Informational	Academic	Internal benchmarking	Strategic	Intra-Organizational	All sectors of activity	Internal	It applies only to the organizational and strategic levels the thing that rounds up its implementation complicates.
7	SCOR: Supply Chain Operation Reference model	Established in 1996 by Supply	One version	physical, informational & financial	Industrial	An Association of Indicators for Each Process and Internal Benchmarking	Tactical & operational	Intra-Organizational, Inter-Organizational, Extended Inter-Organizational & Multi-chain	All sectors of activity	Internal & external	No company is able and willing to explore the opportunities offered by the SCOR model [44]

Nbr	Model name	Creation date and creator	Number of versions	Flow type	Place of appearance (Academic or industrial)	Type of performance indicators	Decision level (stra_oper a_ tacti)	Type of organization	Activity area	Benchm-arking type	Application constraints
8	ASLOG audit: Association for Logistics Audit	Created in 1995 by ASLOG [45]	One version	Informational & physical	Industrial	Internal benchmarking	Tactical & operational	Intra-Organizational	All sectors of activity	Internal	It is geared towards small businesses with low or medium maturity [46] It does not contain a clearly expressed underlying concept [47]
9	SASC: Strategic Audit Supply Chain	Created in 1999 by Peter Gilmour [48]	One version	Informational & physical	Academic	Internal benchmarking	Strategic, Tactical & operational	Intra-Organizational & Inter-Organizational	All sectors of activity	Internal	It does not establish the links between the organization of the supply chain and its performance. [49]
10	Global EVALOG	Created in 1999 by Odette International Limited and Automotive Industry Action Group	One version	Informational & physical	Industrial	Six standard indicators (the indicators are fixed in advance)	Tactical & operational	Intra-Organizational, Inter-Organizational	Industrial	Internal & external	It was developed specifically for the automotive industry, but it has also been used for other related sectors (metallurgy, chemistry, etc.). [49]
11	WCL: World Class Logistics model	Established in 1990 by Michigan State University [50]	One version	Physical, informational & financial	Academic	The degree of integration of a participant and the extent of the control of the concept of the offer	Strategic & Tactical	Intra-Organizational & Inter-Organizational		Internal & external	
12	AFNOR FD X50-605	Created in 2008 by AFNOR	One version	Physical, informational & financial	collaboration Academic and Industrial	Choose among indicators for measuring logistics performance	Strategic & Tactical	Intra-Organizational, Inter-Organizational & Multi-chain	All sectors of activity	Internal	This model does not contain any particular constraints.[49]
13	SCM/SME: Supply Chain Management/ Small and Medium-Size d Enterprises	Created in 20007	One version	Physical & informational	Industrial	Internal benchmarking	Strategic& Tactical	Intra-Organizational, Inter-Organizational & Multi-chain	Industri al	Internal	This model is intended to SMEs for consumers products.[49]
14	EFQM Excellence mode: European Foundation for Quality Management Excellence model	Created in 1992 by European Foundation for Quality Management	One version	Informational & financial	Industrial	Margins, cash flow, inventory turnover Indicators related to customer satisfaction Indicators relating to personal and enterprise integration	Strategic& Tactical	Intra-Organizational, Multi-chain	All sectors of activity	Internal	This model is suitable for any company looking for continuous improvement.

Nbr	Model name	Creation date and creator	Number of versions	Flow type	Place of appearance (Academic or industrial)	Type of performance indicators	Decision level (stra_oper a_ tacti)	Type of organization	Activity area	Benchm-arking type	Application constraints
15	SCALE: Supply Chain Advisor Level Evaluation	created in the early 2000s by the Institute for Supply Chain Excellence (ISLI)[51]	One version	Physical, informational & financial	Academic	Indicators for assessing value creation	Strategic, Tactical & operational	Intra-Organizational, Extended Inter-Organizational & Multi-chain	All sectors of activity	Internal & external	This model does not inject the quality approach into the logistics vision; But in the context of continuous improvement and customer satisfaction it is really disrupted [52]
16	SPM: Strategic Profit Model:	Established in 2000 by Ohio State University [53]	One version	Financial	Academic	Financials indicators	Strategic	Intra-Organizational, Inter-Organizational, Extended Inter-Organizational & Multi-chain	All sectors of activity	Internal & external	The implementation of the model is primarily strategic and is based on cost factors (return on assets and net worth). [49]
17	CPFR : Collaborative Planning, Forecasting, and Replenishment	Established in 1998 by Voluntary Interindustry Commerce Solutions (VICS)	One version	Computing	Industrial	General Indicators such as: Inventory, Forecast, Service Level, Completion Time, Unscheduled Replacement, Obsolete, Distribution, Planning, Sales Data Synchronization	Strategic	Inter-Organizational,	Industrial	Internal & external	This model may have significant barriers in collaboration between organizations
18	St. Gallen Management Model	Created in 1968 by Ulrich [54]	Renew by Rüegg-Stürm in 1998; [54]	Informational	Academic	Internal and external benchmarking	Strategic & operational	Intra-Organizational & Inter-Organizational	All sectors of activity	Internal	This model outlines economic and ecological challenges that require a new framework of this model for management [55]
19	VCOR: The Value Chain Operational Reference model	Created in 2008 by Value Chain Group	One version	Informational, physical & financial.	Academic	Indicators relate to product development perspectives and customer relationships	Strategic , tactical & operational	Intra-Organizational & Inter-Organizational	All sectors of activity	Internal, external	
20	ARIS: Architecture of Integrated Information Systems	Created in 1994 by software company IDS Prof	Renew by Scheer GmbH in 2002	Financial, informational & physical	Industrial	Internal and external benchmarking	Strategic	Inter-Organizational	All sectors of activity	external	This model is mainly based on information systems design
21	Y-CIM Reference Model	Created in 1980 by Scheer [56]	Y-CIM Model for Services [57]	Informational & physical	Industrial	Internal and external benchmarking	Strategic	Inter-Organizational	Industrial & service	Internal & external	The application of CIM systems in small and medium-sized enterprises is not effective
22	Aachener PPS: production planning and control system model	Created in 1998 by Luczak [56]	Renew in 2001	Informational	Academic	Indicators of planning and control of production systems [56]	Strategic	inter-organizational	Industrial	Internal & external	

Nbr	Model name	Creation date and creator	Number of versions	Flow type	Place of appearance (Academic or industrial)	Type of performance indicators	Decision level (stra_oper a_ tacti)	Type of organization	Activity area	Benchm-arking type	Application constraints
23	Model PPMS	Created in 1996 by Friborg University (Switzerland)	One version	Informational	Industrial	Financial indicators and indicators relating to innovation, the customer, the company and the employee[58]	Strategic	Intra-Organizational & Inter-Organizational	Industrial & service	Internal & external	this model does not take into account the financial aspects
24	ECOGRAI	Created in 1990 Bitton [21] in GRAI Laboratory	One version	Informational	Academic	Internal and external benchmarking	Strategic & operational	Intra-Organizational & Inter-Organizational	Industrial & service	Internal & external	The interaction between this model and its environment is not sufficiently addressed
25	Functionality Economy (FE)	Developed in the 80s by Walter Stahel [24]	Renew by Dominique Bourg in the years 2000.	Physical & financier	Academic	Sustainable Development Indicators and External benchmarking	operational	Intra-Organizational	Industrial & service	Internal & external	For some, the question of the sustainability of the products on which the model is based would even be a brake on innovation. The economic benefits for business and society are difficult to discern [26]
26	Industrial Ecology (IE	Created in 1989 by the journal "Scientific American"	One version	Physical & financier	Academic	Sustainable development indicators and external benchmarking	operational	Intra-Organizational	Industrial & service	Internal & external	this model faces synergetic obstacles [59,60]

Table 2 Reviewed hybridization of maturity models.

Hybridization	ABC	BSC	GSCF	APICS	ECR	FLR	SCOR	ASLOG	SASC	EVALOG	WCL	AFNOR FD X50-605	SCM/SME	EFQM	SCALE	SPM	CPFR	St. Gallen Management Model	VCOR	ARIS	Y-CIM	PPS	COGRA	PPMS	EF	IE
ABC:																										
BSC:	[61]																									
GSCF	0	0																								
APICS	0	0	0																							
ECR	0	0	0	0																						
FLR:	0	0	0	0	0																					
SCOR:	[62]	[63]	0	[64]	0	0																				
ASLOG audit:	0	0	0	0	0	0	0																			
SASC:	0	0	0	0	0	0	0	0																		
EVALOG	0	0	0	0	0	0	0	0	0																	
WCL:	0	0	0	0	0	0	0	0	0	0																
AFNOR FD X50-605	0	0	0	0	0	0	0	0	0	0	0															
SCM/SME	0	0	0		0	0	0	0	0	0	0	0														
EFQM:	0	[65]	0	0	0	0	0	0	0	0	0	0	0													

Hybridization	ABC	BSC	GSCF	APICS	ECR	FLR	SCOR	ASLOG	SASC	EVALOG	WCL	AFNOR FDX50-605	SCM/SME	EFQM	SCALE	SPM	CPFR	St. Gallen Management Model	VCOR	ARIS	Y-CIM	PPS	COGRA	PPMS	EF	IE
SCALE:	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
SPM:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
CPFR	0	0	0	0	0	0	[66]	0	0	0	0	0	0	0	0	0										
St. Gallen Management Model	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									
VCOR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
ARIS	[67]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
Y-CIM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
PPS	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0					
ECOGRAI	[68]	[69]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
PPMS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[70]	0	0	0			
EF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
IE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[25]	

V.DISCUSSION

After classifying the essential Supply chain performance evaluation models according to essential characteristics that can be useful to choose the appropriate models, in this section we discuss the essential mode

- The most cited model is developed in university or known company as a consequence the whole model doesn't take into consideration the availability of models to the Small and medium-sized enterprises. In contrast to other models, supply chain master treats maturity in Small and medium-sized enterprises.
- In fact, there are two types of performance measurement models: i) traditional performance models that are focused on financial key performance indicators, and ii) non-traditional, key performance indicators driven from non-financial performance (quality, flexibility). The major contribution focuses more on key financial drivers to pilot the overall performance, that can be a limitation of the model, especially in companies based on services or new technologies.
- Academics and practitioners are increasingly interested in the design of maturity models and PMS but there are few works interested in implementation of models or the standardization of performance, the lack of a reliable methodology and identification of key performance indicators affect transparency in the standard measurement; consequently, these indicators become insignificant.
- There are few models issued in collaboration with academic structures and industrial companies, the collaboration of academic structures and industrial companies can develop the best adopted model.
- The whole models don't take into consideration the interaction between different KPI, and the influence of each KPI on maturity.
- There isn't the new standard to adapt to performance in order to achieve the industry 4.0 maturity, a serious work must be done in this field in order to integrate KPI of smart technologies in Supply chain performance evaluation models

VI. CONCLUSION AND PERSPECTIVES

This work provides a literature review of existing models and the hybrid model. In this review, we classify different models according to different criteria like a number of versions of each model, type of organization that created the model …. Also, we review the hybridization that exists in literature between all of the cited models.

the future research will mainly focus on the following questions:

- How to generate new evaluation models that can incorporate new ways of creating value for the entire supply chain and respect the new concepts of industry 4.0 and new technologies like blockchain?
- How different KPI interact in order to achieve maturity models?
- How to adopt the different models of the Small and medium-sized enterprises?
- What are the minimum levels the company must have to implement the different models?

The interest of studies in this field is that they require a satisfactory analysis to measure the performance of companies in different areas, which helps managers to make the choice and implement the appropriate maturity model for the company.

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