



State of the Art of SCM and TRM in Morocco

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Abstract: Within the previous two decades there has been a significant amount of research focused on Supply Chain Management (SCM) and Road Freight Transport (TRM). This paper presents an inventory of fixtures for these two concepts, given their importance and closely related roles for the growth of any organization producing goods or services.

In this article, we first tackled the different definitions assigned to the SCM in a chronological order and then we dealt with some models and references used in this framework.

in the second part we approached the TRM in general by targeting recent researches carried out in order to situate ourselves in relation to them in terms of mastering and proposing solutions that can minimize the risks of TRM, and lastly we focused on the TRM case of Morocco in dealing with its regulations, its risks, its organization and its harmful environmental effects.

Keywords: SCM; QCD Triangle; TRM; SCOR model; ASLOG; EVALOG referential; sustainable development;

I. Introduction

A review of the literature makes shows clearly the essential role of logistics in the development of any company, it allows the delivery of the products to the customers respecting the QCD trilogy (Quality, Cost and Delay) while synchronizing the supply with the demand. Among its main resources, it uses transport to assure the link between different elements in the supply chain, which is a driving force in the logistical approach.

Transport especially that of goods is undeniably necessary for the well- functioning of the productive fabric through its presence at the level of all the links within the value chain, from upstream to downstream. This is a support sector contributing to national growth, as evidenced by the positive correlation between the evolution of overall economic activity and the growth of the sector.

In an increasingly competitive environment, road transport companies around the world face a series of dynamic problems related to risk. For a logistics service company or for a company that uses the services of such a company ,a number of issues arise when considering the carriage of goods by truck, including cost-effectiveness, supply chain and suppliers risks, compliance with customs regulations and Other cross-border requirements,

In terms of sustainable development (SD), transport plays an important economic and social role. However, its negative impact on the environmental and road safety makes its reconfiguration necessary.

Today, risk management for the TRM remains a major challenge in a global context of respect for the environment and meeting the requirements of sustainable development.

This article aims at reviewing the latest developments in the field in order to better situate ourselves in relation to the work of other research laboratories, to have a clearer idea about the evolution of the SCM concept with respect to time, and to present a status report of road transport of goods in Morocco.

II. Definition and Evolution of Supply Chain Management

According to the literature review of Supply Chain Management, we found that it is a recently used concept even if it has actually been used, especially in the military field.A research that was carried out the ELSEVIER group indicated the presence of more Of 13,424 searches in the Supply chain Management field since 2009 reflecting the huge interest devoted to this concept. In the following text,we present the historical evolution of SCM and the link between Logistics and SCM,

The American Marketing Association[1]: logistics involves the movement and handling of goods from the point of production to the point of consumption or use.

According to John Magee [2] logistic is defined as "the technique of controlling and managing the flow of materials and products from their source of supply to their point of consumption"

[3]He treated the difference between Supply Chain Management and the classic purchasing and production management:



- "The supply chain is seen as a single process. The responsibility for its various links is not fragmented and delegated to several functions: production, purchasing, distribution and sales.
 - SCM requires and ultimately relies on strategic decisions. "Providing" is a common goal for almost all the links in the chain and is of particular strategic importance because of its impact on overall costs and market share.
 - The SCM calls for a different conception of stocks that serve as a direct, rather than an indirect, balance.
 - A new approach to systems is needed, which tends towards integration rather than creating interfaces. " According to [4]"The purpose of supply chain management is to synchronize customer needs and material flow from suppliers in order to achieve a balance between high-level service objectives, minimum inventories and reduction of unit costs - often considered to be contradictory. " Depending on [5]"the SCM corresponds to the integration of processes in a global steering approach." With [6]"A strategic supply chain includes "... at least two companies in a logistics chain that enter into a long-term contract; ... the development of trust and commitment in the relationship; ... integration of logistics activities with sharing of demand and sales data; ... the possibility of an evolution in the location of the control of the logistics process. "
 - [7]"Say that Supply chain management is "... a philosophy that aims at an integrated management of all the flows of a distribution channel, from the supplier to the end user."
 - [8]"Supply chain management covers all material flows, from suppliers to ultimate users ..."
 - [9]"A network of connected and interdependent organizations, work in a collaborative way to control, manage and improve all physical and it workflows from suppliers to ultimate users"
 - [10] The SCM typically involves several functions led by a manager responsible for coordinating the entire material procurement process; It also requires mutual relations with suppliers at several levels. The SCM is a concept "whose main objective is to integrate and manage the purchasing, flow and control of materials in all systems, through multiple functions and levels of suppliers."
 - [11]"The network of organizations that are linked through upstream and downstream relationships in the various processes and activities that produce value in the form of products and services in the hands of the ultimate customer."
 - [12]"The systemic, strategic coordination of the traditional business functions and the tactics across these business lines within a particular company and across businesses within the supply chain, And the supply chain as a whole"
 - [13]"Supply Chain Management (SCM) plays an important role on increasing productivity of any organization and making it more efficient"
 - [14] "SCM is the coordination of production, inventory, rental, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served"
 - [15]"The SCM is an approach to integrating key business processes whose purpose is to create value for customers and stakeholders in the Supply Chain"
 - [16]"Training a supply chain out of a group of individual companies with the purpose of acting like a single entity is even harder"
 - [17]SCM issues require the mobilization of new, more appropriate and more complex tools
 - [18]In order to develop supply chains (sustainable supply chains),all the involved organizations should work cohesively and constructively towards the bigger goal of achieving the triple bottom line objectives (economic, environment, social) of sustainability.
- In connection to SCM, there are several models and data repositories that assures its improvement,[19]put a few models and references of logistics chain management as SCOR model [20].
- The logistics guide ASLOG [21] In addition, the reference system of EVALOG [22] and again [23]achieved a great deal of the existing references in the SCM.
- According to the definitions cited above, we can point out that the SCM plays a predominant role in the integration and coordination among all the actors in the logistics chain (transport, production, distribution, etc.) in order to increase productivity, improve the value chain and ensure the sustainable development of industries.

III. Road Transport of Goods

Ensuring the optimization in a company is done by mastering all the operations that influence the global logistics chain .And among the major engines of the chain we will treat the transport and more specifically the road transport of goods and its presence in the context of Sustainable Development, focusing on the major research carried out in this field. Transport is a very evolutive sector given the number of the research



projects carried out in this domain (more than a million just in the last three years according to the editors of ELSEVIER).

[24]emphasizes in his book “Transport and Territory”: “This thirst for mobility, the need ,which is found in all societies, to always go to a better place than theirs , has led people to constantly imagine new means of transport that allow them to go faster and further. This reflects the real need for transport that satisfies the criteria of speed and safety again.[25]Mentioned that transport is a service of intermediate consumption, it is an auxiliary element of the professional activity whether it is leisure or production.

[26] point out that the growth of road freight transport in Europe calls for a European road network review .But despite the efforts made by the European Community on this issue, the design, construction and heavy goods transport operations are not yet well defined. The result is that the number of existing and planned infrastructure is far from being able to satisfy the need for the drivers’ safety.

Road freight transport has been under supervision of the European Union organization for a long time. In Europe, approximately 72% of total land freight transport is made by road [27]In addition, the same mode of transport is expected to increase by 50% I-TREN 2030).

Several efforts have been made to plan, finance and regulate the main European highway network [28].

[26]Addressed the safety of TRM by using parking management, road network and infrastructure examination.In this connection[29]state in their article that the choice of TRM traffic time plays an important role in reducing congestion.

The term sustainable development, which came into being in 1980,published in the report of [30]is defined as: "meets the needs of future generations without compromising the ability of future generations to meet their own needs". It was elevated to the rank of ‘world mission’ by the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992. [31].

The concept of sustainable development has attracted the attention of industry, associations, researchers ... given the need to adopt economic development through TRM while considering the environment.

Thus [32]have addressed the TRM in its environmental approach .Their work contains considerable data of recent research related to the green road transport of the commodity.TRM plays a very important role in the economic development ,but this is critical for the environment as well as for the human health.

Just recently there is an enormous importance offered to the reducing the cost of TRM [33], [34], [35]currently the whole world is beginning to give importance to the environment,so logistics companies and transporters of Commodities focus more on the effects of TRM;

These include pollution, accidents, noise, resource consumption, deterioration of land use and climate change risks [36].

According to the European Commission's Green Paper (EC, 1993) road freighttransport,only diesel is used, which was the most polluting of all means of transport. We also found a study By[37], [38],[39] and [40]who have divided the factors that influence fuel consumption into five categories: vehicle, environment, journey, environmental conditions .However, driver influence remains relatively difficult to measure.TRM is a sector full of risk and has Harmful effects to the environment, especially when talking about the informal sector that can aggravate the situation.

Recent studies in road transport of green goods [41],[42]have stressed the importance of technical research to identify the risks of managing and standardizing the sector.

The TRM is part of a closed loop that encompasses several functions and constraints.According to many researches done in the field we have found that, the TRM has two main functions: speed and security,which are at the same time contradictory, especially in a space presenting an unsatisfactory road network. This ahs lead several researchers to focus on this concept in order to find some solutions such as infrastructure improvement, parking management, traffic timing ..., the aim of which is to minimize the accident risks and congestion. Other researches have focused on sustainable development in view of the need to strike a balance between the profitability of industries, the satisfaction of transport needs and the protection of the environment.

IV. Road Transport of Goods in Morocco: Situational Analysis

In a competitive environment, transport is necessary for the well-functioning of the productive fabric given its presence throughout the value chain from upstream to downstream.

According to the National Federation of Road Transport (FNTR) In Morocco, transport plays an important role in economic and social terms:

- It represents 6% of PIB(Gross domestic product) and 9% of the value added of the tertiary sector; for all modes combined,
- transport accounts for 34% of the national consumption of energy;
- It employs 10% of the urban labor force.



• The product of its taxation contributes to the revenue of the General Budget of the State with up to 15%.

Road transport in Morocco is dominant in domestic transport. It employs 80% of the workforce in the transport sector in with its entire means. It ensures 90% of the mobility of people and 75% of the flow of non-phosphate goods, on a road network of nearly 60 000 km, in addition to 1 000 km of motorways that is functioning now and 1 500 km to be finished soon. This network includes 6,000 structures, 56% of which are bridges and 35% of scuppers. This network supports the circulation of nearly 50 million Km / day vehicles produced by a fleet of 2.3 million vehicles (at the end of 2007).

The fleet of international road transport vehicles (TIR) of goods consists of 1246 vehicles belonging to 403 companies. The majority of this fleet is domiciled in Casablanca, which has 114 companies

In 2006, the Casablanca delegation of the Ministry in charge of transport issued:

- 259 time permits to 38 companies.
- 1964 travel authorizations to 55 companies.
- 2777 MA authorization to cooperate with 21 companies.

For its part, the Moroccan Association of International Road Transport issued in 2007:

- 1709 triptych notebooks D17 to cover 724 500 temporary importation operations of TIR trucks,
- In addition, 612 triptych notebooks D20 to cover 218,500 temporary export operations of TIR trucks.

These statistical data show that:

- The TIR fleet represents 4% of the total freight transport fleet expressed in number of vehicles,
- TIR enterprise represents 2% compared to the number of business engaged in the carriage of goods by road made for other purposes.

According to Article 11 of Dahir No. 163.260, as amended and supplemented in particular by Act No. 16.99, authorize any natural or legal person who has been registered in the special register of motor carriers of goods the access to Public transport service at urban, national and international levels.

Morocco is a member of nine international conventions, the main ones being: the CMR convention in 1956, the ATP agreement of 1970 and the ADR agreement signed by Morocco in June 2000.

However, freight transport remains poorly developed due to its fragmented structure; the dilapidated nature of its park, its high cost and the shortcomings in terms of organization and management. (Ministry of Economy and Finance, 2013).

To improve this situation, the Moroccan government is engaged in a process of development and modernization of infrastructure (National Investment Plan 2008-2012), the national investment plan for the development of transport infrastructures dedicate a Budget of 120 billion Dirhams to develop the infrastructure.

Road freight transport accounts for 75% of national freight, consisting of 20 000 carriers with 73 275 trucks, 53% for non-owned and 47% for properly owned.

The TRM suffers from several difficulties, which slow down its development and block its operation. According to (Ministry of Equipment, Transport and Logistics, 2013) among the major difficulties of TRM is: atomicity; Fragmentation and the presence of the informal sector of TRM, it is in this context that freight transport for all modes has undergone important reforms in recent years, aimed at improving the competitiveness of the sector in terms of quality, time, cost and organization.

In 2003, the Moroccan state implemented the reform of the TRM, whose objective is to make it a dynamic and competitive sector. The reform also aims elevating the national transport to the level of international standards and to adapt it to the global economy.

The 2003 TRM reform addresses four main axes (TRM Reform, 2003)

- Encouragement of private initiative.
- Redefinition of the relationship between loader and conveyors.
- Integration of the formal park in the organized sector.
- Professionalization of the sector.

Despite the efforts of the state, the objectives of the 2003 reform are not fully realized, due to the lack of control over the informality and the evolution of the tonnage transported.

In May 2010, as part of the national strategy for logistics competitiveness, the government introduced an action plan devised by the minister in charge, in agreement with the professionals, to overcome the difficulties of the 2003 reform.

The aim of the action plan was to strengthen the organization of the freight transport sector and to improve the legal environment of the MRT, improve the competitiveness of MRT companies, develop TIR and modernize road transport.

The statistics made by (Ministry of Equipment and Transport, 2012) details the factors that generate risks of accidents in the road as follows:



- The nature of the vehicle.
- Driving license seniority.
- Driver.
- Infrastructure.
- The environment...

For the factor related to the nature of the vehicle in relation to the age of the driving license, we have found the results in the following table:

TAB 1: distribution of the drivers involved according to the nature of their vehicle and the age of the license.
Source: Compilation of Accident Statistics for Road Traffic in 2012

Driving license age	Delivered in Morocco		Delivered abroad	
	car	truck	car	Truck
- 0 to 1 year				
▪ Temporary licence	313	24	27	1
▪ Licence start	75	4	11	
▪ Non-specified	426	42	94	1
- 1 to 3 years	6201	582	777	11
- 4 to 7 years	8855	1350	893	17
- 8 to 11 years	8262	1103	563	13
- 12 to 15 years	6038	693	214	2
- 16 to 19 years	4679	507	146	3
- 20 to 25 years	6138	629	151	5
- 26 to 30 years	2502	343	75	1
- 31 to 35 years	2009	244	61	
- 36 to 40 years	1049	97	67	2
- 41 to 45 years	414	30	47	
- 46 years and more	284	16	25	3
- NON - SPECIFIED	3945	318	225	5
TOTAL	51190	5982	3376	64

According to the table, we have been able to make three main remarks. The first is that the bigger the number of licenses, the greater the number of accidents, and consequently the lower the risk. Secondly, by comparing a Moroccan license with the others abroad it appears quite clearly that with a permit issued abroad there is less risk compared to that issued in Morocco; and the last remark is by comparing the number of car accidents with that of trucks we found that the TRM using truck presents less risk compared to the car.

In terms of sustainable development, Morocco is well integrated into the sustainable development approach. It has established laws and regulations in the field of logistics, transport and sustainable development, but these remains insufficient to solve problems related to TRM.

The transport sector contributes with 23% of total carbon dioxide emissions worldwide. Road transport, cars and trucks produces more than 60% of these emissions[43]. More precisely, in Third World countries, trucks and buses consume more fuel and emit more CO₂[44].

In the Moroccan context, the logistics chain is characterized by a certain heterogeneity concerning the level of consumption and emission of vehicles, and a drastic lack of data. Countries such as China, Germany and France have deployed policies to collect data about the greenhouse gas emission rate, the modal configuration of the transport sector, and the carbon content for each type of fuel [45].

Each type of fuel has a CO₂ content, by evaluating the amount of fuel burned over a given period; the amount of CO₂ emitted can be estimated. This "top-down" approach makes it possible to estimate overall the quantities produced[44] and [46]"Measuring carbon" means more than estimating annual metric tons. A "bottom-up" approach is needed to measure carbon. This mode of data collection is concerned with the distribution of emissions by sector, vehicle type, and fuel type, CO₂ content, to calculate the emission rate by country. One of the most widely used approaches is the ASIF approach proposed by [46].



Morocco joins this growth of emissions, due mainly to a strong industrialization and a socio-economic flourishing. Fig1 represents the country's emissions over a 50-year period (World Perspective, 2014), the data were estimated using a top-down approach to calculate emissions from the CO₂ content of each fuel type when burned, and the quantities of fuels sold by sector of use.

The annual average of Morocco is 21862 metric tons metric ton is equivalent to 1000 kilograms. The illustrated change is 1290%, the lower and upper limits are 1962 with 3080.3 and 2010 with 50608.3 (World Perspective, 2014)

CO₂ emissions (metric tons), Morocco

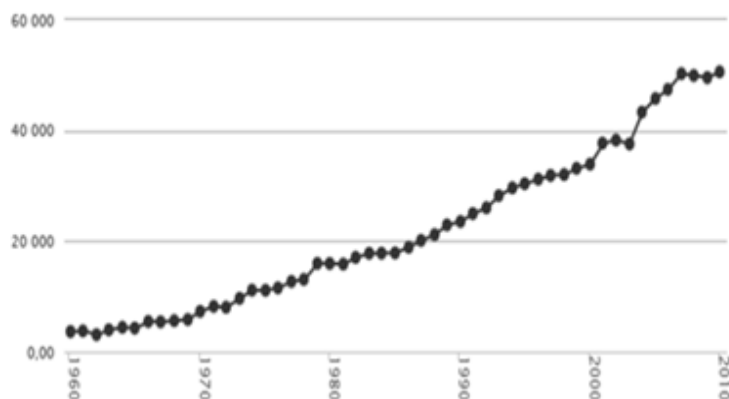


Fig.1. Morocco's CO₂ emissions in metric tons

Source: the World Bank, Perspective world, University of Sherbrook, 2010

There are three main families of possible reductions in the transport sector; the first two acts more on the development of the urban or rural environment, the third addresses the technological aspect of the means and methods of transport:

Minimizing the produced emissions by reducing the kilometers traveled. A vehicle that runs more produces more. This reduction can be achieved by modifying the urban or rural environment in such a way as to make services more accessible (housing, industrial districts, city centers, entertainment, etc). Other approaches have proposed that companies could reduce emissions, durations and loads by planning delivery routes using specific decision support tools [47].

Morocco is a country in full awareness of the role of TRM and of the constraints that slow down this sector. According to the statistics mentioned above, we find that the TRM contributes a considerable benefit to the Moroccan economy. In order to favor this sector and to overcome its various constraints the state has set up reforms and regulations which gave a favorable but unsatisfactory result. In this respect the scientific researches that took Morocco as a case in point have marked the need to organize the sector and to control its CO₂ emissions which evolve drastically.

V. General Conclusion

The present work sets up the historical evolution of the SCM concept given its necessity in the control of all operations of the logistics chain, and more particularly transport. The transport sector, notably in its commodity component, is of major importance in the economic dynamics. Its importance stems from its contribution to the functioning of product markets and production factors firstly and its contribution to the improvement of macroeconomic variables secondly. The high cost of transport increases the burden on businesses and, consequently, on consumers. It also affects the competitiveness of domestic firms abroad and reduces the attractiveness of the country for direct investment abroad.

The freight transport sector in Morocco suffers from several difficulties, which hamper its integrated development. The main hindrances are related to the organization of the profession, the relative lack of infrastructure for some of its components, and delays in logistics services. The actions undertaken by the government are thus aimed at modernizing and upgrading the sector by improving the organization and functioning of the sector as a whole, with a view to improve competition and competitiveness and handling the sector through an environmental approach.



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