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Major: Distribution & Supply Chain
Management**

**The impact of COVID-19 on the
automotive logistic transport and agile risk
management integration.
Case study: Renault Algeria**

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Dedication

Shout out to the precious people in my life who supported me, helped me and loved me unconditionally:

My beloved mother, the best and strongest mom in the world.

My beloved father who I wish was here to see his little girl graduating.

My beloved aunt, my second mother, and my best-friend.

My older brother, my wall, and my bank account.

My younger siblings, my source of annoyance.

My partner in this dissertation and in crime.

My best friends who love the most.

And finally to myself for surviving till this moment.

ELHAMDULILAH

LiLy

Dedication

I want to thank God for standing by me now and ever and for the countless blessings he blessed me with.

This thesis is the outcome of countless hard work and support. I wanted to dedicate this work proudly to my family whome supported me all along my journey. To my beloved friends whome I shared good and unforgettable moments with, with a little bite of misery without which memories couldn't have been any better, to my “H73” fellas “I, L, M, F, Y, A, H, H”. to my partner in crime Lamis working with you made things much easier AZIIN. To my two beloved friends Nada and Nessou whome have been there since day one. To the person that came all of a sudden to my life yet made it worth living who had helped me a lot all along with this thesis and in life in general. And last but not least I wanna thank me, for believing in me and for helping me tho it was a tough journey yet it was worth it.

5 years are done and greater success is yet to come inshallah!.

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Abstract:

The Covid-19 crisis has unprecedentedly impacted many sectors globally since its first appearance in 2019, such as tourism, health, trade.

The automotive sector has also been hit hard by the epidemic. The automotive supply chain, in particular, has been weakened by this global phenomenon. Despite the gradual easing of government restrictions, the impact of Covid-19 can still be felt in the automotive industry.

The sector had to adjust to the new situation, evaluate the risks that appeared and implement effective supply chain strategies to decrease the negative impact of the pandemic, and this can be done by establishing management risk strategies.

Risk management has always been the subject of research. Since every organisation faces many challenges throughout the year, Searching for causes, consequences, and solutions is every economic actor's field of interest, especially regarding the automotive supply chain and the transport challenge during the Covid-19 era.

Although risk management has many approaches, such as Agile risk management, that proved effective in the face of the risk that occurred during the global health crisis.

Renault was no exception; the world's leading automotive manufacturer also faced many transport and supply chain challenges. Its success depends on establishing strategies to increase the performance of the automotive supply chain regardless of the risk faced during the pandemic.

Through this work, we will be able to detect firsthand the impact of the Covid-19 on the automotive supply chain, precisely the transport function and the adoption of risk management with all of its approaches.

Keywords: automotive supply chain, risk management, agile risk management, transport, Covid-19.

Resumé

La crise Covid-19 a eu un impact sans précédent sur de nombreux secteurs à l'échelle mondiale depuis sa première apparition en 2019, comme le tourisme, la santé, le commerce.

Le secteur automobile a également été durement touché par l'épidémie. La chaîne d'approvisionnement automobile, en particulier, a été fragilisée par ce phénomène mondial. Malgré l'assouplissement progressif des restrictions gouvernementales, l'impact de Covid-19 se fait toujours sentir dans l'industrie automobile.

Le secteur a dû s'adapter à la nouvelle situation, évaluer les risques qui sont apparus et mettre en œuvre des stratégies de chaîne d'approvisionnement efficaces pour diminuer l'impact négatif de la pandémie, et cela peut se faire en établissant des stratégies de gestion des risques.

La gestion des risques a toujours fait l'objet de recherches. Chaque organisation étant confrontée à de nombreux défis tout au long de l'année, la recherche des causes, des conséquences et des solutions est le champ d'intérêt de chaque acteur économique, notamment en ce qui concerne la chaîne d'approvisionnement automobile et le défi du transport à l'ère du Covid-19.

Bien que la gestion des risques ait de nombreuses approches telles que la gestion agile des risques, qui s'est avérée efficace face au risque survenu lors de la crise sanitaire mondiale.

Renault n'est pas une exception ; le premier constructeur automobile mondial a également été confronté à de nombreux défis en matière de transport et de chaîne d'approvisionnement. Son succès dépend de l'établissement de stratégies visant à accroître les performances de la chaîne d'approvisionnement automobile, quel que soit le risque encouru pendant la pandémie.

Grâce à ce travail, nous serons en mesure de détecter de première main l'impact du Covid-19 sur la chaîne d'approvisionnement automobile, précisément la fonction transport et l'adoption de la gestion des risques avec toutes ses approches.

Mots clés : chaîne logistique automobile, gestion des risques, gestion des risques agile, transport, Covid-19.

ملخص:

أثرت أزمة كوفيد-19 بشكل غير مسبوق على العديد من القطاعات على مستوى العالم منذ ظهورها لأول مرة في عام 2019 ، مثل السياحة والصحة والتجارة .

كما تضرر قطاع السيارات بشدة من الوباء. لقد أضعفت هذه الظاهرة العالمية سلسلة توريد السيارات على وجه الخصوص. على الرغم من التخفيف التدريجي للقيود الحكومية ، لا يزال تأثير كوفيد-19 محسوسًا في صناعة السيارات.

كان على القطاع التكيف مع الوضع الجديد ، وتقييم المخاطر التي ظهرت وتنفيذ استراتيجيات سلسلة التوريد الفعالة لتقليل التأثير السلبي للوباء ، ويمكن القيام بذلك من خلال وضع استراتيجيات إدارة المخاطر.

لطالما كانت إدارة المخاطر موضوع البحث. نظرًا لأن كل منظمة تواجه العديد من التحديات على مدار العام ، فإن البحث عن الأسباب والعواقب والحلول هو مجال اهتمام كل فاعل اقتصادي ، خاصة فيما يتعلق بسلسلة توريد السيارات وتحدي النقل خلال عصر كوفيد-19.

على الرغم من أن إدارة المخاطر لها العديد من الأساليب مثل إدارة المخاطر الرشيقة ، إلا أن ذلك أثبت فعاليته في مواجهة المخاطر التي حدثت أثناء الأزمة الصحية العالمية.

رينو ليست استثناء. واجهت الشركة المصنعة للسيارات الرائدة في العالم أيضًا العديد من تحديات النقل وسلسلة التوريد. يعتمد نجاحها على وضع استراتيجيات لزيادة أداء سلسلة توريد السيارات بغض النظر عن المخاطر التي تواجهها أثناء الوباء.

من خلال هذا العمل ، سنكون قادرين على الكشف المباشر عن تأثير كوفيد-19 على سلسلة توريد السيارات ، وعلى وجه التحديد وظيفة النقل واعتماد إدارة المخاطر بكل مناهجها.

الكلمات المفتاحية: سلسلة توريد السيارات ، إدارة المخاطر ، إدارة المخاطر المرنة ، النقل ، كوفيد - 19.

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List of Abbreviations

Abbreviation	Full expression
Covid-19	Coronavirus disease.
SCM	Supply chain management.
SCRM	Supply chain risk management.
CLV	Dilevery centre of Renault ALGERIA.
CLE	Shipping centre of Renault ALGERIA.
OEM	Original Equipment Manufacturer.
SKD/CKD	Semi Knocked Down/Completely Knocked Down.
ROAM	Resolve, Own, Accept, and Mitigate.
R&D	Research and Development.
ISO	International Organization for Standardization.
JIT	Just in time.
JIS	Just in sequence.
B2C	Business to consumer.
B2B	Business to Business.
IT	Information Technology.
BMW	Bayerische Motoren Werke.
NTR	Nothing to report.
UNCTAD	United Nations Conference on Trade and Development.
SUCC	Licensed agent.
BTO	Build to order.
GM	General motors.
N.S.U.	Neckarsulmer Strickmaschinen Union.
CUSMA	Canada-United States-Mexico Free Trade Agreement.
CEO	Chief excutive officer.
EU	European union.
GUI	Graphical user interface.
SNVI	National company of industrial vehicles.
TSMC	Taiwan semi conductor manufacturing company.

NGO	Non-governmental organizations.
FT17	Renault light tank.

Summary

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Introduction

Introduction

Today's automotive industry represents a high value-added sector; it includes specialized equipment manufacturers and manufacturers of passenger cars, leisure vehicles, commercial vehicles, and bodywork. This activity, therefore, integrates the entire sector, including engines and upstream mechanical components, as long as they are mainly intended for motor vehicles.

The automotive manufacturing industry combines integrated producers, designers, assemblers, principals, subcontractors, and service providers to fit out motor vehicles.

This industry changed throughout time. The industry that we know today is so different from what has come before because simply owning the car remains essential, and there are many reasons why people should be looking to improve their car ownership, and the business people interested in this field to always thrive and more invention.

It has been evolving through time, from small-scale production to mass production, then the concept of small-scale mass production, and finally, a personalized production.

This sector seems to bring new developments and things to be excited about yearly.

Many players interact within this industry: designers, assemblers, parts suppliers, equipment manufacturers, transporters, sales representatives, etc. each actor plays a role in the operation to achieve the goals desired by the organization.

In the automotive sector, logistics plays a vital role at all levels, from the design stage, through production, to distribution, and from the supply of parts used in the production line to the delivery of vehicles to dealerships. Any automotive manufacturer prioritises the supply chain process since it is the key to the company's success.

The coronavirus outbreak in 2019 could be categorized as the most significant event to affect economies in generations, with ripple effects in the automotive market and supply chain for years after. The Covid-19 pandemic is an unprecedented crisis; it has generated massive upheaval in companies and stimulated new thinking about safety. Risk management plays a vital role, especially during the health crisis in at-risk industries regarding the global supply chain.

The health crisis has disrupted the global supply chains in most industries, while the automotive industry has a complex supply chain characterized by just-in-time inventory

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management and a small inventory buffer, making it vulnerable to disruptions. This industry plays an essential role in the global economy and affects many people; it is interesting to investigate how companies have handled the risks and disruptions during this time.

We can say that management risk also plays a vital role in the efficiency of the automotive supply chain.

One of the significant risks and challenges is the health crisis that first appeared in China in 2019 and then spread worldwide.

At first, it paralyzed almost every activity, and the automotive industry, being a global business, was also affected; by the shutdown, the quarantine, the governments' restrictions, and land logistic transportation issues. It hit the automotive industry hard, especially the Transportation of the vehicles and raw materials or the components of the vehicles.

Although supply chain risk management is based on a structured risk management process, the first two steps, namely identification and assessment, have become decisive for the successful implementation of any SCRM (supply chain risk management) system by doing everything possible to ensure that these risks do not materialize, since there is no such thing as zero risk.

The health crisis made all the automotive companies put into practice many strategies to manage the risk appeared, and our main goal is not only to search into those practices but also to search through the causes and the challenges accrued during that period.

Establishing a Risk management methodology was unavoidable for the automotive supply chain, especially regarding logistic Transportation, since all the global brands outsource different components from other countries. At the top of them was China, the leading supplier of semiconductors.

Another concept that should have been added to the risk management during that dark period is Agility, the quick and efficient response was essential, yet not all industries came to that point.

Agile practices could have been the best solution to manage risks while appearing in the automotive supply chain since uncertainty is the main characteristic of the Covid-19.

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We decided to formulate this research aiming mainly to investigate the effects of the pandemic on the automotive industry, specifically on the automotive logistic Transportation that appeared as a consequence of the epidemic.

As a result, the overall question study to which this thesis will answer is:

"How does the integration of agile risk management interfere with the impact of the health crisis on automotive logistic transport?"

For better encircling of the latter, we considered that it would be convenient if we divide it up into:

Q1: What role does the automotive logistic plays in the sector?

Q2: Did the covid-19 affect the automotive logistic Transportation?

Q3: Does agile isk management required in the automotive supply chain?

These sub-questions have brought us to formulate these initial research hypotheses, depending on prior personal perception and initial research; we have been able to conceive three main assumptions:

H1: In the automotive sector, logistics plays an important role at all levels.

H2: Auto logistics has been hit hard by global restrictions and regulations put in place to cope with the health crisis.

H3: Agile risk management is highly relevant in auto logistics.

In-depth documentary research, through the consultation of several books, articles, specific websites, and academic works related to our subject of study.

To verify the affirmation or the cancellation of the previous assumptions, we will adopt the following methodology:

In-depth documentary research, through the consultation of several books, articles, specific websites as well as academic works related to our subject of study, also internal documents of the company,

According to the nature of the study, it appeared convenient to use a descriptive and analytical approach through a qualitative study chosen following the objectives of this research. That had the purpose of collecting maximum data in addition to our observations

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during the internship; we also held interviews with the Delivery centre Renault Algeria employees.

Furthermore, to accomplish our research, we will structure our work into three chapters:

The first chapter: is devoted to the automotive supply chain, which firstly presents a brief history of the evolution of the automotive sector and its specification, then a search on the definition of the automotive supply chain, its components and stakeholders.

Finally, we will conclude with the notion of risks and risks in automotive logistic Transportation.

The second chapter: will highlight the health crisis consequences on the automotive supply chain focusing on the logistic transport, then we will explain the risk management process and its importance during that period, and finally, we will introduce the agility approach in risk management and its prominent role during the pandemic.

The last chapter: Finally, this research will highlight the impact of the Covid-19 outbreak on Renault's automotive supply chain, more specifically, the logistic Transportation in the delivery centre of ALGIERS.

It will also describe how Renault reacted during this period to decrease the risk faced using the risk management approach.

To this end, we decided to embrace the search through the risks of Covid-19, as it was challenging to look through such a subject considering it was a sensitive era for the automotive industry, which got hit hard by the consequences of the pandemic and emphasized on the need of SCRM strategies to decrease the negative impact of the global phenomena.

This research allowed us to explore the pandemic's different dimensions and the health crisis's outcomes and see from an automotive company perspective how to implement an effective strategy in the face of the risks.

Chapter 01 :

A theoretical approach to the automotive supply chain.

Chapter 01: A theoretical approach to the automotive supply chain

Introduction of the chapter

In the first chapter, we will discuss the different concepts related to the automotive supply chain, including the risks that surfaced in the latter. This chapter is divided into two sections: The content of the first section will go through the fundamentals of the automotive industry (history, the definition of the supply chain in the automotive industry, and its stakeholders...) The second and the last section will focus on the notion of risks with the various risks faced in the automotive logistic Transportation.

Section 01: fundamentals of the automotive industry

The rise of the automotive industry pushed the world to accord more importance to its supply chain management.

The more this industry develops, the more its supply chain turns complex.

The human's desire for evolution boosted innovation to another level, and as an addition, the economic actors of the industry turned their attention to search into the automotive supply chain, what does it mean; its components and so on, in order to achieve or create an efficient mechanism

For better performance.

1. The improvement of the automotive industry

1.1 The automotive industry definition

The automotive industry concerns specialised equipment manufacturers, passenger, recreational, commercial, and bodybuilders. Therefore, this activity integrates the entire sector, including engines and mechanical components upstream, as long as they are mainly intended for motor vehicles.

Automotive manufacturing combines integrated producers, designers, assemblers, contractors, subcontractors, and providers of automotive fitting services.

1.2 History

The automobile was first invented and perfected in Germany and France in the late 1800s. Henry Ford innovated mass-production techniques that became standard, and Ford, General Motors, and Chrysler emerged as the “Big Three” auto companies by the 1920s. However, Americans quickly dominated the automotive industry in the first half of the twentieth century. Manufacturers funneled their resources to the military during World War II, and afterwards, automobile production in Europe and Japan soared to meet growing demand. Once vital to the expansion of American urban centres, the industry had become a shared global enterprise with the rise of Japan as the leading automaker by 1980.

Although the automobile was to have its most significant social and economic impact in the United States, it was initially perfected in Germany and France toward the end of the

nineteenth century by such men as Gottlieb Daimler, Karl Benz, Nicolaus Otto, and Emile Levassor.¹

➤ First Fuel Engine in 1876:

The engine was developed due to discovering new energy-carrying mediums, such as steam in the 1700s, and new fuels, such as gas and gasoline in the 1800s. Shortly after the invention of the 4-stroke internal combustion gasoline-fueled engine in 1876, the development of the first motor vehicles and the establishment of the first automotive firms in Europe and America occurred.²

➤ From handicraft to mass production:

By the end of the 19th century, the automobile was ready. However, it has not yet wholly rid itself of the concept of the horse-drawn carriage. In fact, the technique requires a specialized driver capable of launching the engine and demonstrating a particular force to steer the vehicle and change the speeds. It is placed in the front, uncovered, while the owner and passengers are installed in an enclosed cabin, the luggage being located in a trunk attached to the rear. Advances in specialised agencies' electric starters, gearboxes, and maintenance will also allow the owner to become the driver. The latter, not wanting to be exposed to the weather, requires protection and imposes the internal driving that will spread from 1904. This configuration marks the final separation of the automobile and the carriage.³

Fig(1;1): Horse-drawn ambulance



SOURCE: Alfred MOUSTACCHI, « AUTOMOBILE - Histoire ».

¹ “Automobile history”(online), Available at <<https://www.history.com/topics/inventions/automobiles>> ,consulted on (4/4/2022).

² “History of Automotive Industry”(online), Available at <<https://www.technofunc.com/index.php/domain-knowledge/automotive-industry/item/history-of-automotive-industry>> ,consulted on (04/04/2022).

³ Alfred MOUSTACCHI, « AUTOMOBILE - Histoire », Encyclopædia Universalis(online) ,Available at < <https://www.universalis.fr/encyclopedie/automobile-histoire/>> , consulted on (04/06/2022).

➤ Horse-drawn ambulance, 19th century:

A horse-drawn ambulance from the first-aid society in Vienna was founded in 1881. The patients lie on bunk beds. The sides are louvred but lined with curtains.

Fig(1;2): Renault inner drive



SOURCE: Alfred MOUSTACCHI, « AUTOMOBILE - Histoire ».

➤ Inner drive

The first Renault car with an “interior driving” body, in 1904

➤ Henry Ford and the Ford T:

Ford, has understood that we were moving into a mass industry and that its first customers would be its workers, adopted Taylor’s methods that he applied to the assembly line. In the logic of mass distribution, it significantly reduces costs through vertical integration and product standardization. In fact, from 1908 onwards, he offered the same car for everyone, black: the Ford T nicknamed the “Lizzie”. More than 15 million units were built between 1908 and 1927, with all employees dreaming of owning one. ⁴



Figure(1;3):ford model T

⁴ Ibid.,4.

SOURCE: Alfred MOUSTACCHI, « AUTOMOBILE - Histoire ».

➤ From the First World War to the crisis of 1929:

Until 1914, the automobile industry manufactured small or medium-sized series except for Ford. The needs of the conflict and the astronomical consumption of ammunition imposed on all European industries, whatever the object produced, the conversion to Taylor and Ford methods.

In France, André Citroën and Louis Renault invested massively in their car factories located on the Quai de Javel in Paris and Boulogne-Billancourt. However, the low income of households impoverished by the war limits the market, which remains very elitist.

In the United States, however, people were no longer satisfied with the monotony of the Ford T. Alfred Sloan, director and then president of General Motors, was the first to understand the need to develop a range of vehicles within each brand.

The power equilibrium involving Europe and the United States was no longer the same as it had been at the beginning of the 20th century.

➤ World War II:

As soon as the Second World War was declared, the French car factories were transformed into armament factories, manufacturing mainly: light tanks, aircraft engines and trucks. A small amount of car production was reserved for the administration. After the French defeat in June 1940, these vehicles were mainly destined for Germany. French production, which was 225,000 vehicles in 1938, fell to 115 civilian cars and 2,590 cars for the German occupiers in 1940 and reached the paltry figures of 55 and 28 in 1944.

On the other side of the Atlantic, the United States, massively converted to the war industry, nevertheless maintained a significant civilian production, with women's labour replacing the men engaged in Europe and the Pacific. The great success of this period was that of the Willys-Overland company, which won the General Purpose Vehicle competition intended to offer the army an all-terrain vehicle for multiple uses. The Jeep (a name derived from the pronunciation of G.P.), produced from 1941 onwards, was a real success.⁵

➤ Mass production:

⁵ Ibid.,4.

After the Second World War, the American automobile market recovered and stabilized at a record level of 10 million vehicles per year in the 1950s. It was essentially supplied by three major manufacturers: General Motors (G.M.), Ford and Chrysler. To avoid the application of the antitrust law, they kept the fourth manufacturer, American Motors, under perfusion. Innovation is permanent and is based on the presentation of aggressive concept cars, such as the Buick Sabre project (developed by G.M. as early as 1950), concentrated on the most advanced techniques of the time and with a design (Harley Earl) inspired by the F-86 Sabre aircraft (which distinguished itself during the Korean War) or the Firebird (G.M., 1958), a stylistic derivative of the Lightning P-38 (the best fighter plane of the Second World War)

In France, the provisional government presided over by General de Gaulle, seeking to implement the program of the C.N.R. (National Council of the Resistance), was inspired by the British example to establish the "Welfare State". With this in mind, in 1946, he launched the Pons plan to concentrate on and specialize in the automobile industry. Renault was to be responsible for the lower end of the range (4 H.P.), Peugeot for the middle range (203) and Citroën for the upper end (11 H.P. and 15 H.P. front-wheel drive). The other manufacturers would have to move closer to one of these three manufacturers and sacrifice their independence.

From 1950 onwards, however, the market demands ended this plan, which was frowned upon by the employers, particularly Simca and Panhard. The French, energized by reconstruction, demanded new products, forcing manufacturers to diversify their product ranges.

With the experience of the two wars and a historical urban habitat that was difficult to remodel, European manufacturers paid particular attention to vehicle dimensions, weight and consumption.

The end of the 1950s saw the success, in France, of an unclassifiable car, the famous Citroën DS 19 (1955), undoubtedly the most sophisticated and revolutionary car of the post-war period. Unfortunately, the successful alchemy between an original design and a mechanical system that was far ahead of its time sterilized the inventiveness of possible successors.⁶

➤ The oil crises:

The automobile product matured at the beginning of the 1970s and few industrial or design advances were expected. The commercial battle was essentially about price and marketing. It

⁶ Ibid., 4.

was in this relatively calm context that the Yom Kippur War (1973) broke out, followed by the first oil crisis. The European industry, already engaged in producing small, fuel-efficient cars adapted to the urban, was, in fact, relatively well prepared for this oil crisis especially since it knew how to be imaginative with Volkswagen and Peugeot, which relaunched the diesel engine.

American carmakers, who are very committed to the fight against pollution (with, in particular, the mass installation of expensive platinum catalytic converters to comply with the 1968 Clean Air Act), are unable to adapt quickly. They impose fuel consumption standards on themselves with the C.A.F.E.

The only compact cars designed as such were the Japanese Mitsubishi Colt, co-produced with Chrysler, the Ford Pinto and the American Motors Gremlin.

Despite a few technical revolutions (the widespread use of front-wheel drive at G.M.), American manufacturers, tired of the competition that imposed too low prices on them, abandoned the sedan market, which Japanese manufacturers gradually dominated, and turned to "specialities" (4 × 4, van, pick-up, large station wagons) that were both more profitable and subject to more tolerant regulations.

➤ The era of the Japanese:

The decline of the American giants in the sedan market since the 1970s is mainly due to the inadequacy of their products, in size and weight (hence high consumption), which remain unsuitable for export. Gradually, the world is discovering Japan's superiority in innovation and production processes that are economical and efficient while controlling quality.

It was the Toyota engineer Taiichi Ohno, on his return from the United States, where he had been stunned by waste, who, in the 1950s, proposed to modify Taylorian concepts by introducing "just-in-time" and kaizen (continuous quality improvement) by making operators more responsible by enriching their tasks, and by improving the supply of workstations by means of the Kanban system (an information system indicating the level of stocks of parts along the line), while preserving costs. These concepts were to become established throughout the world from the 1970s onwards. Moreover, thanks to their mastery of electronics, the Japanese did not hesitate to "gadget" their cars to the great satisfaction of their customers.⁷

⁷ Ibid.,4.

Unfamiliar with the diesel engine, Japanese firms (Honda, Mitsubishi, Nissan and Toyota) invested heavily in the gasoline engine, making decisive progress in terms of power and pollution control with the development of multi-valve engines and electronic intake control and the use of lean mixtures.

Europe and the United States, improved their manufacturing processes by copying Japanese methods and designing "intelligent" machines such as giant multi-axis robots, flexible workshops, and fast-machining machines, which allowed the operator to modify the process and thus produce several different objects in masked time.

Finally, although Europeans have mastered multi-valve engines and catalysis, they have maintained their lead in diesel engines by developing direct injection, common rail and, in the mid-1990s, the particulate filter.

In all areas of the automobile, this tremendous revival is nevertheless confronted with a major challenge. With current technology, despite significant progress and innovations such as the stop and start system developed by Valeo and Citroën, the transition to anti-pollution standards is tricky. Indeed, under the pressure of the evolution of safety standards and new services made possible by electronics, the weight and dimensions of vehicles are increasing, which is in perfect contradiction with the will to reduce the emissions of atmospheric pollutants (mainly CO₂).

Still, due to the lack of a diesel culture, Japanese firms Honda and, above all, Toyota has been marketing gasoline-electric hybrid vehicles (Toyota Prius) since the late 1990s, which, despite their costs, have been more than just a success.⁸

2. Specificities of the sector

2.1 A robust competitive context

➤ The Competitive Situation at the Dawn of the Second Century

In the early twenty-first century, the automotive industry is finding itself in a more competitive market, which is difficult to explain with current theories of craft, mass production, and lean production (Womack and al., 1990), or craft and lean production (Boyer

⁸ Ibid.,4.

and Freyssenet, 2002), or Fordist and post-Fordist practices (Hounshell, 1984). This is because the competitive landscape is not divided as it was for most of the nineteenth century.

The globalization of business in the 1990s was accompanied by a wave of mergers, which has blurred the lines of what constitutes national identity. In the same way, corporate brand identity is no longer as easily identifiable with a specific location. Many companies are multinational now, and their products are produced in many different regions. As a result, it becomes difficult to make regional comparisons. Furthermore, this dilutes the incentives for policy-makers to offer incentives for local manufacturing.

The competitive realm of the motor industry has changed dramatically in recent years. Craft, mass, and lean production processes have been blurring into one another due to many producers adopting lean practices. In addition, some traditional producers such as Rolls-Royce and Ferrari use lean manufacturing in their luxury vehicles, while other companies, once referred to as craft producers, use mass-production techniques on their assembly lines. Standardized components and work practices are standard among manufacturers today, and craftsmanship is primarily used for marketing purposes rather than being an active part of the day-to-day production processes.

While manufacturing methods have changed since the turn of the twentieth century, the way we sell and distribute vehicles has not changed much, according to Henry Ford's philosophy. This logic was exemplary when demand exceeded supply.

In today's market, where overcapacity and fashion-conscious consumers result in manufacturers' overproduction of vehicles, the consequences are devastating: manufacturers use increasing sales incentives to sell off their overproduction, causing erosion of brand image and a decrease in residual values. The decrease in residual values puts further strain on manufacturers such as GM and Ford, which currently derive greater profits from their financing operations than from manufacturing cars. Given the current make-to-forecast practice and levels of incentives, this situation may very well change in the future. Since the beginning of the new millennium, the Big Three in North America have been fighting a war of attrition over incentives.⁹

⁹ Matthias Holweg, "The evolution of competition in the automotive industry" (online), Available at <https://www.academia.edu/36232076/Beyond_Mass_and_Lean_Production_On_the_Dynamics_of_Competition_in_the_Automotive_Industry>; consulted on (04/10/2022).

The product spectrum of automobiles has dramatically expanded. Manufacturers once offered only a tiny car, a mid-size car, and perhaps a sports car; today, their product ranges include a wide range of vehicles in the supermini, compact, mid-size, executive, MPV, SUV, UAV, and crossover segments. Moreover, the model life cycle has shortened from five years in Europe and the United States to three years (Holweg and Pil 2004). At the same time that manufacturers have tried to increase market share by offering more models in shorter life cycles that cover less time overall in the market, they have experienced severe diminishing returns on sales volume due to this strategy.

In conclusion, the auto industry's competitive realm and the vehicle manufacturers' strategies are far less distinctly defined than they used to be. All manufacturers have adopted the need to provide variety and choice from Ford's mass production system, which Sloan demonstrated at GM during his tenure as president, and the lean production paradigm that laid the foundation for Toyota's success. In response to lean production techniques, manufacturing vehicles has changed considerably. Sales strategies, however, have not been significantly altered due to the overcapacity of the market, increasing levels of dynamic variety, and customers who demand customised products. The sale of large vehicle stocks and sales incentives are inevitable by-products of the forecast-driven production and sales strategies that most manufacturers continue to pursue. In order for companies to overcome this second legacy of the mass production system—the forecast-driven production planning and vehicle supply—early adopters of build-to-order strategies, such as Volvo (Hertz et al., 2001) and Renault ('Project Nouvelle Distribution'), have begun to link the mass production facility to customer demand. This is an attempt at fulfilling what Stan Davis put forward in 1987 as an oxymoron: 'mass customisation'—the individual customisation of a vehicle that is manufactured using mass production techniques.¹⁰

➤ The Dynamics of the Competitive Realm:

Today, most manufacturers show elements of all three Ford models (the craft model of Ford's River Rouge Plant; Sloan's focus on mass production; and Toyota's lean manufacturing system), as well as many aspects of the Toyota model (the focus on reducing waste through continuous improvements). The phrase 'the one best way strategy' has gone out of fashion. The competitive realms have gone through clear phases in the past. However, currently, there

¹⁰ Ibid.,10.

is a far less clear understanding of what will prove to be most successful in providing sustainable competitiveness.

Looking back at the industry's earliest days, it is possible to see a pattern that has emerged as the industry developed. This pattern is likely to repeat itself moving forward with each new propulsion breakthrough: in the early 20th century, the market was undeveloped, and car ownership was primarily a privilege of the wealthy. Henry Ford achieved economies of scale and mass production by aligning demand with production by making high volumes, which reduced manufacturing and marketing costs, thereby reducing prices and increasing demand. This strategy was one of Ford's most enduring legacies, yet it is one that automakers face today: how to reduce overcapacity and align demand with production without resorting to

The Japanese superiority in manufacturing drove the following change in the competitive realm. Initially belittled in the Western world, it soon became apparent that Japanese vehicles not only were built much more efficiently but also had much better quality, adopting the lean production paradigm was surprisingly slow, but in the end, it fundamentally changed the way we think about manufacturing today. Toyota was clearly able to diversify itself by developing an area of leadership, the manufacturing process in its case. In parallel, many manufacturers have developed their area of leadership: BMW as the technology leader, focusing on the driving experience, Volkswagen as the source of reliability and continuity in both design and product technology, Audi in terms of its 'Quattro' all-wheel-drive technology, or more recently Renault using innovative product designs as a differentiator.

The dynamics of the competitive environment are much like those of other markets: Once a new technology is introduced, companies focus their efforts on cost, and once the market saturates, competition shifts toward choice and variety. As the market further matures, the focus shifts toward product diversification or differentiation through leadership in manufacturing, brand image, or design. Nevertheless, beyond this diverse product offering lies the final frontier in manufacturing industries: mass customisation, the ability to provide products customised to individual customer wishes.

The question arises of what is to come next? Where is the competitive field going to shift after mass customising products? As we have observed in other sectors, the offer of services around the product could provide further differentiation.¹¹

¹¹ Ibid.,10.

Nevertheless, even if such advanced service offerings were to become mainstream soon, in terms of manufacturing strategy, however, such a shift would have little impact. Manufacturers would still build vehicles to customer specification, even if the customer does not own the vehicle anymore, but simply remunerates a service subsidiary of the manufacturer for using the vehicle. Other analysts argue that the Internet will drastically alter how we market and sell cars, just as telematics provides radically new ways to redefine vehicles as communication platforms. The largely unfulfilled promises of e-commerce and Internet applications, as well as the slow

establishment of telematics applications in vehicles, however, cast serious doubts over their potential to radically alter competition in the automotive industry.¹²

2.2 The automotive industry globalization:

➤ Globalization and the new contracting structure of the auto industry

The automotive industry is being affected by globalization. The demand for cars has changed its international structure, with mature markets such as the United States, Europe and Japan no longer experiencing growth due to substitution demand. However, demand and market growth are to be expected in emerging markets like Brazil, India and China and, partly, in countries that are peripheries of large existing markets areas like East Europe and Mexico.

Overseas demand for cars is boosting the internationalization of auto manufacturing. In fact, during the 1990s, most automakers pursued a strategy of "produce where you sell," opening new plants in foreign countries and asking some suppliers to follow them with direct investment.

This happened for several reasons.

When designing cars for emerging markets, manufacturers must consider the differing needs of customers in those markets. Governments in emerging markets often put trade and manufacturing policies in place that hinder imports and favour foreign direct investment from large multinational companies. Locating operations near the target market can give manufacturers an advantage in marketing, sales, and logistics. When comparing costs between locations, labour costs are often much higher than other expenses such as shipping or taxes.

¹² Ibid.,10.

In light of the new framework, OEMs and suppliers have redesigned their relationships in the following ways: Suppliers play a more prominent role in parts design and technology development; sometimes, they even assemble parts themselves. On the other hand, OEMs tend to focus on fewer types of operations.

More generally, assemblers have employed a series of measures to lower the minimum scale of vehicle assembly plants (Florida and Sturgeon, 1999) in order to reduce investment risk, respond more flexibly to volume changes, speed up models turnover, facilitate equipment upgrading, minimize job impact and social cost in case of crisis. Financial considerations are especially critical given the enormous amount of money required by foreign direct investment strategies and the uncertainty of their rate of return and payback time.

Globalization has spurred competition, shaping a new international division of labour in the auto industry, where suppliers can achieve economies of scale and specialization, and OEMs can reduce the costs stemming from their international strategies. To this end, new technologies facilitate knowledge codification (Nonaka and Takeuchi, 1995), reduce information costs, and move toward mass customization and build-to-order (Helper and MacDuffie, 2000). These technologies tend to lower the transaction-specific nature of information, knowledge and capabilities, reducing coordination costs for market-type relationships.

As a result, the new global auto industry supplier consolidation has increased as automakers outsource more component design and manufacturing to suppliers (Fine, 1998). This has led to a power shift in favour of suppliers and continued outsourcing by OEMs.

Even though OEMs are moving assets off their books by supplying parts to suppliers, designing and managing an international supply chain remains a complex task for them. Trying to use e-business tools (B2C and B2B) across the supply chain, facing different national and regional institutional settings, seeking cost savings in low-wage countries and minimizing investment risk not only imply a different partition of tasks and rights across the supply chain but also impact on product architecture which feeds back into greater product design/technological complexity (Sako et al., 1999; Fujimoto & Takeishi 2001).¹³

¹³ Arnaldo Camuffo, Rolling Out a "World Car": Globalization, Outsourcing and Modularity(online), Available at <https://www.researchgate.net/publication/37592462_Rolling_Out_a_World_Car_Globalization_Outsourcing_and_Modularity> consulted on (04/15/2022).

Modularization is one way to address this complex issue and reduce the cost of manufacturing vehicles. Modularization means that, in the future, vehicles will probably result from the integration of a series of self-contained functional units with standardized interfaces within one or more standardized product architectures (Helper, MacDuffie, Takeishi and Warburton 1999).

Currently, the term “modularity” is still somewhat vague in the auto industry. Practitioners use it to cover a wide variety of practices whose common elements (and relationship to any core definition) are relatively few. This relates to the fact that modularization has only recently moved its first steps in the auto industry and that drivers and purposes of modularization are diverse across regions and companies (product design, manufacturing, work organization, inter-firm relationships).¹⁴

3 . Definition and components of the automotive supply chain

The automotive and transportation supply chain involves all incoming and outgoing materials, services and parts that pertain to your business operations. The success of your enterprise depends on the reliability and consistency of automotive manufacturing logistics. Several aspects of SCM's automotive and transportation industry (supply chain management) are critical to its success. They can be modified to suit your needs better: integrating technology, identifying and collecting data, developing detailed logistics plans, and using innovative third-party logistics providers as linchpins in the supply chain.¹⁵

Charter (2001) defines the automotive supply chain as all business activities related to the relationships between the sales channel, distribution, warehousing, manufacturing, transportation, and suppliers. It also encompasses related functions and facilities in the flow from the raw materials stage—metal or steel, alloys, and plastics—to sub-assembly modules (components and parts) and finished products—vehicles—delivered to end-users.

Supply chain management is a set of processes that synchronize the supply of products to customer demands, optimizes inventories held, and minimizes waste. In the automotive industry, for example, supply chain management includes components or modules suppliers (Tier 1 - 3), original equipment manufacturers (car manufacturers), distributors, and dealers (retailers).

¹⁴ Ibid.,14.

¹⁵ PurolatorInternational, What You Need to Know About AutomotiveSupply Chain Management, april 2021.available at < <https://www.coursehero.com/file/103517928/What-You-Need-to-Know-About-Automotive-Supply-Chain-Managementpdf/>> consulted on (05/20/2022).not added.

The hierarchical network of suppliers is divided generally into three levels :

First-tier suppliers - are global located world producers of completed modules (e.g. dashboard, engine, seating etc.) with their own manufacturing or assembly capacities established mainly near automakers plant considering logistics way in the condition of JIS (just-in-sequence) or JIT (just-in-time) delivery specifications; they are incorporated into the OEMs product development projects and innovation process this means that they make their own engineering decisions and designing solutions with establishing local engineering or development centre.

Second-tier suppliers are those companies that supply parts for assembly units. They are typically local companies with their own production or assembly plants near to first-tier suppliers (global or regional players).

Third-tier suppliers are raw material producers and companies with manufacturing capacities for small, simple parts and individual components (e.g. plastic parts, metal parts, aluminium parts), which fulfil mainly the quality and volume conditions of second-tier suppliers. Some also deliver to first-tier suppliers (e.g. coiled sheet).¹⁶

4. The stakeholders of the automotive supply chain

4.1 Stakeholder theory and the stakeholder definition:

Throughout the years, many definitions written by many authors have appeared :

"Evans and Sawyer (2010) state that stakeholders refer to all parties that support the wealth-creating activities of companies."¹⁷

"Ditlev-Simonsen and Wenstøp (2013) identify governments, customers, employees, and the company's owners as key stakeholders."¹⁸

According to Freeman, from a strategic management perspective, the stakeholder theory is grounded in the assumption that a company should develop its policies and strategies to address the needs of various stakeholders that impact its operations.

¹⁶ Andrea Lešková, «LOGISTICS CONCEPT OF SUPPLY CHAIN IN AUTOMOTIVE PRODUCTION», available at <http://web2.vslg.cz/fotogalerie/acta_logistica/2012/3-cislo/4_leskova.pdf>, (consulted on 04/04/2022).

¹⁷ Evans, N. and Sawyer, J, "CSR and stakeholders of small businesses in regional South Australia" (online). Social Responsibility Journal, 2010, 6(3), pp.433-451, Available at: <<http://dx.doi.org/10.1108/17471111011064799>>, (consulted on 04/04/2022).

¹⁸ Ditlev-Simonsen, C. and Wenstøp, F; How stakeholders view stakeholders as CSR motivators (online); Social Responsibility Journal, 2013, 9(1), pp.137-147, Available at: <<http://dx.doi.org/10.1108/17471111311307868>>, (consulted on 04/04/2022).

This theory was developed in response to the competitive environment in which the company conducts its business, the fact that it increasingly needs to compete on the global stage and engage in more complex activities than was previously the case (Mainardes, Alves and Raposo, 2011).¹⁹

As a result, the term stakeholders of a company refers to all of the actors whose interests will be affected by the company's activities and who participate in its economic life somehow. They impact company decisions and are distinguished by their power based on what they bring to a company and what they expect. It should be noted that each stakeholder can directly impact a company's governance and growth and development strategy.

Dansky and Gamm (2004) opted to categorise the company's stakeholders based on three groupings. According to this categorisation, the company has internal stakeholders, such as employees and management. Some stakeholders are external to the company but have some measure of involvement. Lastly, the so-called boundary stakeholders interact with one another by transcending borders between the company and its stakeholders (Dansky and Gamm, 2004).

4.2 The role of stakeholders in the supply chain:

In Supply Chain, the stakeholders are a broader and more comprehensive group that includes material and service suppliers, delivery and logistics companies, and customers and consumers. Government and local government regulations, as well as the actions of competitors, connect them as stakeholders in this process.

In the context of SCM, stakeholders may be part of the considered SC (e.g., in the form of suppliers or customers) or, while being SC-external actors, recognise the impact of the SC actors' performance. According to this distinction, stakeholders comprise primary stakeholders, such as customers and suppliers or employees and top managers, secondary stakeholders, such as government and non-governmental organisations (NGOs), trade associations and competitors, or media and community (Meixell and Luoma 2015).²⁰

¹⁹Svensson, G, Ferro, C., Høgevoid, N.; Padin, C. and Sosa Varela, J.C, "Developing a theory of focal company business sustainability efforts in connection with supply chain stakeholders"(online) , Supply Chain Management ,an international journal ,2018, Vol. 23 No. 1, pp. 16-32.,vailable at < <https://ur.booksc.eu/book/68242876/3fbf0c>>, (Consulted on 04/04/2022).

Stakeholder groups pressure focal companies to improve their supply chain's sustainability performance. Local, national, and international regulations set by national governments or international regulatory bodies typically generate governmental pressures and incentives. External stakeholder groups influence a firm's competitive advantage and reputation, forcing companies to transparently monitor and control sustainable Supply chain performance.

4.3 Stakeholders of the automotive supply chain:

Many economic actors in the automotive supply chain have power that derives from what they bring to the supply chain and what they expect from it.

This is a very heterogeneous set of entities or individuals who are either directly or not directly involved in the day-to-day operations, management and governance of the supply chain, such as:

➤ Suppliers:

Companies that manufacture goods that are used in the production process of an automobile or become part of an automobile, such that they supply these goods directly or indirectly to an automobile manufacturer, synonymous with Original Equipment Manufacturer (OEM).²¹The automotive companies may depend on one particular supplier that produces a superior or rare component, and In that case, the supplier is more important. Because vehicles have many moving parts, the parts supplier is an essential link in the automotive supply chain. Automotive suppliers are typically classified into Tier One, Tier Two, and Tier Three. Tier One suppliers are companies that supply finished parts/components explicitly designed for vehicles to the auto OEM (original equipment manufacturer), frequently with direct relationships with specific automakers. Tier two suppliers are even further away. They also manufacture required parts, but their brands are not limited to vehicles. For instance, a semiconductor manufacturer would qualify, and some Tier Two suppliers may have components used in Tier One components. Tier Three suppliers are another step away. Those would be the suppliers of raw or unfinished materials required to manufacture the vehicles. These materials, including plastics and metals, are forwarded to the automaker and each tier of suppliers. Evolving

²⁰Rebs, T., Brandenburg, M., Seuring, S. et al, "Stakeholder influences and risks in sustainable supply chain management: a comparison of qualitative and quantitative studies"(online), Bus Res 11, 197–237, 2018, Available at

< <https://link.springer.com/article/10.1007/s40685-017-0056-9> >, consulted on (04/04/2022).

²¹ Gelowicz, S., "What Are Automotive Suppliers? Basics, Ranking and Examples!", 2019, available at <<https://www.spotlightmetal.com/what-are-automotive-suppliers-basics-ranking-and-examples-a-802457/>>, consulted on (04/04/2022).

technologies have compelled the use of more high-tech components and thus more automotive suppliers, but these tiers have primarily remained stable. Choosing suitable suppliers is one of the most important aspects of a process's success; it is critical to have the proper supplier selection criteria to determine which companies are worth working with, whether for body components, engine parts, or other elements.

➤ Designers:

Automotive designers, also known as automotive stylists, are specialised industrial designers who combine their technical knowledge of mechanics, production, and materials with artistic talent to improve the style, appearance, and ergonomic and aerodynamic design of automobiles.²²

Designers can be stakeholders because their perspective or their point of view has to be taken into consideration in order for the project to be taken place.

➤ Final Assembler or manufacturer:

An auto assembler is responsible for installing parts and components in motor vehicles. In addition, he inspects vehicles for flaws. He or she can also run various tests to ensure that the assembled equipment works as expected.

Automobile assemblers must have both hard and soft skills. They have to be able to use a variety of tools and equipment to ensure the proper assembly of a motor vehicle. Furthermore, assemblers must communicate and collaborate with their peers and superiors and ensure that all the assembly line teams can work together to achieve the best results.

The final assembler is a stakeholder because he has many responsibilities for the manufacturing process; he creates value by setting up the final vehicle for the next operation.

➤ Dealers:

Most automobile manufacturers sell and service their products through a network of franchised dealers. These dealers both perform the initial sales process and provide after-sales services.

²² "Automotive designers", Available at <<https://firsthand.co/professions/automotive-designers>>, consulted on (04/14/2022).

A car dealership, also recognized as vehicle local distribution, is a company that sells new or used cars at retail through a dealership contract with an automaker or its sales subsidiary. It can also transport a wide range of Certified Pre-Owned vehicles. It hires automobile salespeople to sell its vehicles. It may also offer car maintenance services and employ automotive technicians to stock and sell spare auto parts and process warranty claims²³.

Considering the value added by the services provided by the car dealers and the tasks realised by them, Car dealers are stakeholders of the automotive supply chain.

➤ Customers:

Many people believe that businesses exist to serve their customers. Customers are stakeholders because they are affected by the characteristics of service/products and their value.

Of course, in the automotive industry, all customers search for the quality of the vehicle and the services provided; they influence the company's decision, especially when choosing the right component supplier.

Also, they got influenced by the companies' decisions, such as the rise in the price of the vehicle.

➤ Logistics staff:

The company's staff or the supply chain specialists have a direct stake since they earn an income and start receiving other benefits (both monetary and non-monetary). They may have a health and safety interest depending on the nature of the business. It is the same in the automotive supply chain; people responsible for the transportation programming of the vehicle, quality checking, delivery services, system responsibilities, and so on they got paid for their services and gain some experience along the way, such as:

- Logistics coordinator: who supports in planning logistics operations.

The company must ensure their safety since the automotive supply chain is full of employee health risks.

➤ 3rd logistics service provider:

²³ "Car dealership" - Wikipedia, < https://en.wikipedia.org/wiki/Car_dealership >, consulted on(04/20/2022).

support for the execution of the logistics operations such as loading and unloading.

➤ Manufacturer maintenance technician:

support for assessing conditions during pre-loading.

5. The role of the Transportation in the automotive supply chain

In any organisation's supply chain, there are upstream operations such as procurement and purchasing and downstream operations consisting of providing products/services to customers. Transport can be upstream to supply factories with raw materials and downstream to distribute finished products to customers. Transportation is an activity that involves moving goods and/or people from one place to another using a mobile vehicle. The transport function deals with issues related to selecting means of transport and arranging trucks and transport equipment

Therefore, it is necessary for each of them to work harmoniously so that their function will be fulfilled. Therefore, it is necessary for

each of them to work harmoniously so that the supply function provides information about The type of merchandise, its transportation conditions and transportation requirements to determine the type of its containers and the type of Transportation, Transportation of finished

vehicles, semi-finished vehicles or semi-finished products may require specific containers. For the Transportation of materials such as aviation, the scarcity of materials for rapid processing without stopping production is required. Transport function Providing the appropriate means of transporting according to the requests of the supply chain, It also justifies circumstances that may lead to delays in delivery or collection, such as layoffs or lousy weather.

In the automotive supply chain, the logistic Transportation is divided into 3 phases or procedures:

➤ Upstream: procurement of spare parts and components:

This process is about moving the purchased components that enter the assembly of a vehicle (car, truck, motorcycle) from the supplier to the storage warehouse (can be an

international supplier since the automotive brands implement subsidiaries around the globe to extend their activity, mainly to the third world). This process can be done by the company itself, the supplier, or using an external transporter's services.

➤ In the assembly phase:

This phase transfers proper equipment or components from the storage warehouse to the assembly plant, depending on the structure or distance between the two. For some companies, the storage warehouse is in the exact location as the plant.

➤ Downstream: final distribution of vehicles:

In the last phase of transportation, interfere in the final distribution of the vehicle from the storage warehouse of vehicles to the final client or the delivery facility if the company has one. It can be done by the company itself, using a transport services or authorised agents.

Section 02: The notion of risk and risk in logistic transport.

No business is free from risks; companies these days deal even assume them before they happened.

The notion of risk occupies a vital place in any supply chain.

It has been a research subject for a long time because of its consequences, so the concept of risk management appeared.

This section aims to present the problem of risk in the supply chain context, where we will be defining the basic concepts of risk and the different types of risk in automotive logistics transportation.

1. Definitions and types of risks

1.1 Risk - an overview

Risks in the supply chain are driven by various uncertain elements largely covered by demand, supply, price, lead times, etc. Risks can therefore take the form of any disruption, price volatility and the perception of poor product or service quality, process or internal quality failures, deficiencies in physical infrastructure, natural disasters or any event that damages the company's reputation. Risk factors also include cash flow constraints, inventory financing and delays in cash payments. Risks may be external or internal and may change depending on the product, financial, information or value flows.

An extensive range of definitions have been proposed to define the concept of risk in general, so in this section, we decided to select the most appropriate among them. "*Rescue*" is the Latin origin of the term risk, which meant "what cuts" as a sign of a danger in that era. In the 14th century, the word was somehow exclusively used in maritime insurance; as of today, this notion has been applied in several areas, particularly those affecting the activities of companies such as economic risks, ecological, technological, health, and natural risks, etc.

Among the listed definitions of risk, we quote the ISO / IEC Reference Guide, which

defines risk as a "combination of the probability of occurrence of harm and the severity of that harm"²⁴. Therefore, the risk is the combination of several factors such as the likelihood of the risk occurrence, its occurrence and its resulting. It is always dealt with risk negatively, although this notion has two faces: One is pessimistic, assuming risk as a cause of loss and waste, and another is somewhat optimistic, considering risk as exposure to danger in the hope of gaining an advantage applying the dare-to-win principle.²⁵

Within a project, the risk is theoretically considered to be any possible deviation from the goal and purpose of the operations. Typically, the risk is associated with other words such as "unfamiliar", "unforeseeable", and "unsure". Our everyday life is full of unpredictable circumstances, some with positive or adverse effects. Likewise, any project operation entails uncertainty and risks, such as transferring materials or persons. However, several academics have attempted to define risk more specifically:

²⁴ IEC Guide 116:2010,3.13, modified.

²⁵ BS ISO 31000:2018, Risk management — Guidelines, The British Standards Institution, 2018 ,Published by BSI Standards Limited, 2018, P:1.

Table (1:1): Risk definition according to different authors:

Author	Risk definition
Lawrence 1976	Risk is the measure of probability and the weight of undesired consequences
Kaplan 1981	Risk equals the triplet (si, pi, ci), where si is the set of scenarios, pi is the likelihood of that scenario, and ci is the consequence of the scenario, i = 1, 2,..., N
Wilson 1982	Risk equals the product of probability and severity
Rosa 1998	Risk is a situation or event where something of human value (including humans themselves) has been put at stake and where the outcome is uncertain.
MIL-STD- 882D 2000	Risk is the expression of influence and possibility of an accident in the sense of the severity of the potential accident and the probability of the event
RMV ISO 2002	Risk is a combination of the probability and scope of the consequences
IRGC 2005	Risk is an uncertain consequence of an event or activity related to something of human value
Campbell 2005	Risk equals expected damage
LSHW 2005	Risk is the likelihood of an injury, disease or damage to the health of employees due to hazards
Aven 2009	Risk refers to uncertainty about and severity of the events and consequences (or outcomes) of activity concerning something that humans value
RM ISO 2009	Risk is the effect of uncertainty on objectives

SOURCE:Adopted from:Sotic, A., Pavlovic. D., Ivetic. M., (2015). ²⁶

From The Description of the analysis of the meanings mentioned above, we can outline two main risk factors: the "likelihood of the case" and the "consequences of

²⁶ SOTIC .A, PAVLOVIC .D,IVETIC .M, "Application of the method of shared more targeted risk in extreme events.", In Proceedings of International Conference Contemporary achievements in construction,Subotica,Serbia,(2015, pp. 527-534. The Review of the Definition of Risk , IIAKM, Available at <http://www.iiakm.org/ojakm/articles/2015/volume3_3/OJAKM_Volume3_3pp17-26.pdf>, (consulted on 05/02/2022).

the incident".

Therefore, the suitable concept for our research is that risk is the probability that an unknown adverse event will occur with disagreeable outcomes.

1.2 Understanding the impact of risk on the business.

It is critical to distinguish between risk and the potential impact of risk events. Reputational damage and business interruptions are often seen as risks when consequences arise from risky events. Boards of directors, senior management, and internal audit may spend considerable time and resources dealing with and attempting to respond to and manage these consequences, but they may never understand or address the underlying risk or the root cause that led to the event.

Various risk events can lead to reputational damage and business disruption. For example, a cyber-attack for ransom, where hackers block access to vital information, can cripple systems until a ransom is paid. If the attack is not appropriately handled, the organisation's reputation will probably be harmed due to events related to cyber security, business continuity and crisis response risks.

When discussing the business disruption that can result from several sources, the risk is not the disruption itself but the organisation's ability to move away from traditional manual practices, leverage data and recently developed technologies to remain competitive in an increasingly complex and technology-driven environment.

With that being said, boards of directors, senior management and internal auditors should be alert to the potential impacts of business interruption and reputational damage. These potential impacts should be integrated into risk analyses. Particular emphasis should be paid to how these possible effects may differ or impact based on the industry and the environment in which the organisation operates.

2. Logistic transport risk

The Automotive Supply chain faces many risks all the time, such as Transportation, and here are some examples :

➤ Countries' restrictions and regulations due to the spread of the pandemic caused limited Transportation:

The Coronavirus is a human-to-human disease that first forced the automotive companies into a lockdown. However, since they had to figure out a long-term solution, companies sent health protocols which are the mandatory safety standards for workers. Standards such as Physical distancing, Hand sanitation, Mandatory masks and protective gloves, and Improved ventilation...

Countries were quick to carry out these measures because they are cost-effective. Moreover, they will also be the last ones the countries can lift. Workers should not only take the time to cooperate with these regulations but also increase state inspections to force compliance.

This, as anyone might guess, makes the overall industry a bit slower.

As almost 80% of car manufacturers manufacture in China, they were among the first industries to feel the effects of the COVID-19 outbreak on car shipping. When the outbreak began, it is become practically impossible to ship cars or car parts outside of China because the country quickly went into lockdown; therefore, international shipping of cars has slowed down considerably. Since it is relatively safe to ship cars even during COVID-19, companies managed to tackle many shipments scheduled before the COVID-19 outbreak. Nevertheless, during the hiatus of the pandemic, international car shipping was practically non-existent.²⁷

➤ The delivery delay:

It is a considerable risk in the automotive logistic transport.

There are many reasons for the delivery delay, such as weather conditions, Intermodal issues, and health concerns...even though the "just in time" does not support any delays in the automotive industry, either delivery delay of the vehicle's components can cause the line production to stop or delayed or the delivery delay of vehicles to the final consumer, and that can decrease the satisfaction of the client.

➤ The potential risk of damage to the car:

²⁷ Scarlet-Rose Duffy, Effects of Covid-19 outbreak on the car shipping industry (online), Global trade magazine, 2020, Available at < <https://www.globaltrademag.com/effects-of-covid-19-outbreak-on-the-car-shipping-industry/>>, (consulted on 5/07/2022).

It is either an accident, or the driver is unskilled. All automotive companies have protocols for this kind of mishap, which define who will assume the responsibility, and if it is the driver's fault, some measures need to be taken.

➤ Poor communication:

It is a significant risk; it can create some issues regarding sensitive pieces of information about the shipment of vehicles; all automotive companies establish communication systems for its worker (between the drivers and the logistics department) to assure safety and keep track of the supplement. The transportation documents are also considered a way of communication between the source and the destination, and those documents can be described as an obligation.

➤ Non-track of the shipping vehicles:

The logistic department needs to know where the vehicles are to control the transportation process and keep costs under control. It can also fast solve any issues accrued. If the vehicles are not-tracked, the theft percentage is high, which may change the driver's behaviour.

➤ Disruption of the shipping route.

➤ Risk of theft:

It is no secret that vehicles can get stolen during their shipment either from the company to the client or from the factory to the delivery centre. It is a high risk any company can face, so hiring skilled drivers, choosing secure road and implementing tracking devices on the supplements are the keys to decreasing such accidents.

➤ Risks of getting damaged during loading and unloading of the vehicle:

- Unexpected departure: The driver moves his truck forward during loading because he thinks it is finished. It occurs when the truck is removed from the quay before the end of the transshipment due to impaired signalling, insufficient communication, and poor work organisation.
- Gradual advance: The truck moves forward little by little during loading due to the inertia of the truck. The air suspension of the trailers can accentuate this phenomenon. Slippage also occurs when the forklift truck brakes suddenly inside the trailer during transshipment, which can lead to the lip of the leveller falling off. Even

a small amount of vehicle overhang can cause people, forklifts and products to fall from the dock.

- Forklift falls: Even when there are no trucks at the loading bay, the bay is dangerous. For example, forklift operators may want to back onto a new levelling bridge when manoeuvring on the dock. A wrong assessment of the distances, late braking, and the truck falls off the dock. A leveller that remains in a low position is also a source of risk because it creates a break in the docking plane.
- Forklift-pedestrian accidents: Forklift traffic is often heavy at the loading dock. A poorly designed dock, excessive speeds due to rushing, and pallets stored in the wrong place can restrict visibility and lead to accidents.

Conclusion of the chapter

Considering the information above, we can conclude that the automotive industry's evolution boosted its supply chain to be more complex with the interference of several stakeholders who influence its decisions.

Due to its nature, it faces different risks daily, especially the transportation risk, which plays a vital role in the function of the automotive supply chain.

Chapter 02:

The Link between the stacks of the pandemic on the automotive logistic transport sector and risk management intervention.

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Introduction of the chapter

Covid-19 has had wide-ranging impacts on many aspects of social and economic life. Social distancing became the norm in many countries, while at the same time, many countries imposed quarantines and other restrictions on people visiting from abroad. Businesses were hugely affected by these measures; many got shut down or declared bankruptcy, leading to many industries' massive impacts on their day-to-day activities.

One of these was the automotive industry which has been severely impacted. As an essential pillar of the global economy, the automotive industry has reacted with determination, as did all players, including traditional OEMs, new entrant automakers, dealerships, suppliers and financial services providers. These entities were rapidly evaluating the influence of the epidemic and taking action to overcome its challenges hand-in-hand with customers and employees, which is called risk management.

Section01: the impact of transport disruption on the automotive supply chain during the pandemic.

1. the impact of covid-19 on the global supply chain:

➤ The surge in the shipping cost :

Shipping freight accounts for 90% of goods transported around the world, and a sudden increase in shipping costs will impact supply chains. According to the Global Container Freight Index, the average global value of transporting a container went from \$1,362 USD in November 2019 to \$9,628 in February 2022. The most expensive routes are from China/East Asia to the North American East Coast (\$16,893 USD) and from China/East Asia to the North American West Coast (\$15,218 USD). Therefore, producers and consumers that rely on China may be experiencing some of the tremendous financial strains. Small businesses and farms can no longer keep pace with increasingly elevated shipping costs. This situation concentrates shipping transportation in the hands of the biggest retailers like Walmart, Amazon, Kroger, and Home Depot, among others.

The high freight rates have been beneficial for the largest shipping companies associated with the World Shipping Council. On January 23, 2021, Alphaliner's top 100 showed that seven transnational corporations controlled 76.9 per cent of the shipping market share: Swiss-Italian company the Mediterranean and its Danish counterpart Maersk control 17.1 per cent and 16.9 per cent, respectively. A significant increase in the cost of shipping has resulted in increased profits for these multinational actors that control the market. For instance, the surging cost of shipping boosted Maersk's gross profits in the third quarter of 2021 to USD \$5.9 billion and sales to USD \$16.6 billion; this was Maersk's best performance since its founding in 1904²⁸.

²⁸ Understanding Supply Chain Disruptions During the COVID-19 Pandemic(online), Available at <<https://www.mcgill.ca/business-law/article/understanding-supply-chain-disruptions-during-covid-19-pandemic>>, consulted on (05/17/2022).

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➤ The weight of China in the crisis as a producer and exporter:

Furthermore, particular attention must be paid to China when assessing supply chain disruptions. As the largest exporter of goods globally and Canada's second-biggest trading partner, any meaningful alteration in China's patterns of production, distribution or consumption of goods—whether caused by a natural disaster or an economic policy—has global consequences. Unsurprisingly, this was the case when the 'Zero-Covid Policy' was implemented in an effort to contain an outbreak of COVID-19 (Covidien Flu). New lockdowns were declared, and the workforce in ports was halved to ensure that an outbreak would not affect all workers. This has increased delays at ports. A recent outbreak of COVID-19 in Zhejiang—which is a manufacturing hub and home to the world's largest cargo port, Ningbo-Zhoushan—caused new quarantine and mobility restrictions for thousands of workers on site. Consequently, "average shipping times from China doubled, and the price of moving a typical container rose from 4 per cent of its value to nearly 20 per cent."

Additionally, China's economy is under pressure because of its dominance in producing Personal Protective Equipment (PPE), such as face masks and surgical gowns—essential products that combat the pandemic. As a result, demand for Chinese PPE has increased the number of shipping routes departing from China to untraditional destinations such as West and East Africa, South Asia, and Latin America. However, there are not enough workers or trucks to load, unload, and distribute the contents of containers; thus, companies prefer to return empty containers to China and navigate through routes that depart to the U.S., which have the highest fare on the market.²⁹

²⁹ Ibid.,41

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➤ Crisis in the North American labour market:

Added to the rising costs of shipping is a crisis in the North American labour market that is causing significant problems in the normal operations of supply chains, particularly in strategic sectors like transportation. When containers arrive at Southern California, Vancouver, or Georgia ports, there are not enough workers to unload and distribute the containers throughout the North American territory, creating bottlenecks (points of congestion) in supply chains. This situation is exacerbated during the storm season, bringing high winds, snow, and choppy seas to ports. To quantify this disruption, “the number of ships waiting to unload at any given time raised from one or two in the summer of 2020 to a high of 82 this past November.” According to Maersk, “the worst delays were still on the US West Coast where ships were waiting four weeks to unload due to the lack of workers on land.”

The shortage of truck drivers and high freight rates have led many shipping companies to return transport containers to Asia without filling them in North America first, resulting in losses for American exporters. Previously, American farmers and smaller companies could fill the containers to ship items such as soybeans or wheat back to Asia. However, transport containers are in such high demand that it is up to eight times more profitable to return containers empty rather than wait for North American exporters to fill them. As a result, over 80% of 434,000 20ft containers exported from the Port of Los Angeles in September were empty; this left American exporters unable to get their products to market.

The available data on the shortage of truck drivers in Canada suggests there were 20,000 vacant truck driver positions in 2021. Likewise, according to the President and CEO of the American Trucking Associations, there is a shortage of 80,000 truck drivers in the US. For the United States—a country where truck drivers move 71 per cent of the economy’s goods—this number represents a 30 per cent increase compared to pre-pandemic vacancies.

Thirty thousand trucks move between the Canada-US border daily, carrying nearly \$850 million in freight. Although a new Canada-United States-Mexico Free Trade Agreement (CUSMA) entered into force on July 1, 2020, the crisis in the transportation sector has been exacerbated by COVID-19 and the regulations that have been issued to prevent the spread of the virus. Quarantines, lockdowns, and mobility restrictions have limited the regular operation of transportation, particularly in transboundary operations. Further, a conflict has emerged between some unvaccinated truck drivers who protested the measure issued by the US on

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January 15, 2022, which requires drivers to be fully vaccinated before crossing the border. The Canadian Trucking Alliance believes that around 26,000 of the 160,000 drivers who cross this border could be impacted. However, the association condemns the ongoing protests, which block public roadways, highways, and bridges.

The truckers' protest converges with structural problems already present in the labour market in Canada. For instance, recent studies show that labour shortage problems existed before the pandemic and will likely be here to stay. The problem is “the result of the aging population and related declining labour force participation, which started over 20 years ago.” The United States must contend with a pre-existing labour shortage and an increasing disinterest of its population in re-entering the labour force. As of January 2022, there are 10 million available jobs, three million more than before the pandemic. However, 5.7 million Americans are actively seeking employment. At the same time, among working-age people who are looking for a job and those currently working -known as the labour participation rate- although it has presented signs of recovery, it has not reached 63%, which was the pre-pandemic rate.³⁰

➤ Shortages of semiconductors and microchips:

The semiconductor and microchip sectors can serve as a microcosm of state responses to supply chain disruptions. These devices play a critical role in the automobile industry, and their shortage severely impacts them. South Korea and Taiwan are two of the world's most important producers of semiconductors, with Taiwan alone producing 20 per cent of the world's supply. Both countries have faced severe challenges dealing with COVID-19, and Taiwan has experienced droughts which have placed an additional strain on its energy sector. Consequently, the United States and the European Union are trying to respond by adjusting their internal and international policies in their supply chain governance and operation.

The report named Building Resilient Supply Chains, Revitalizing American Manufacturing, And Fostering Broad-Based Growth, commissioned by President Biden to ascertain supply chains vulnerabilities in the US, recommends direct intervention in four core sectors: “semiconductors and advanced packaging, large-capacity batteries of the sort used in electric vehicles, critical minerals and materials, and pharmaceuticals and advanced pharmaceutical ingredients.” Similarly, the EU has allocated a portion of its USD \$884 billion to fund

³⁰ Ibid.,41

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Europe's semiconductor design and manufacturing capabilities. Other countries could adopt similar policies to cover their population's most basic needs and compensate for industries currently affected by supply chain disruptions.

➤ New production and consumption patterns:

As some reports have shown, shareholder pressure on publicly traded companies to shift production towards lean manufacturing also strains the traditional operation of supply chains. Companies have been reducing their investment in warehousing and the costs associated with it instead of relying on global shipping, mainly originating from China, to store their goods. This change in production and distribution patterns is possible thanks to sophisticated algorithms that estimate each product's consumption trends and delivery times. By using such algorithms, publicly traded companies are saving money that can be used, among other purposes, to pay out dividends to shareholders.

Changing patterns of consumption are also causing supply chains disorders. The growth in consumer demand due to increased fiscal stimulus and tax returns, mainly in developed countries, means certain population sectors have accumulated money due to disrupting spending habits. Given that consumers have more money to spare because they have not spent it on their habitual expenses and want to avoid getting infected by COVID-19, there is an augmented reliance on e-commerce. As the United Nations Conference on Trade and Development (UNCTAD) has revealed, global e-commerce has jumped to USD \$26.7 trillion because of the pandemic's sharp rise in home delivery. Further, US online revenue increased by USD \$105 billion in 2020, resulting in USD \$791.70 billion in online sales, the highest increase in any year according to the available data.³¹

2. the covid-19 impact on the global automotive supply chain:

Indeed, the shock of the crisis has hit carmakers hard, as they manufacture vehicles on a "just-in-time" basis and depend on an uninterrupted supply of materials and components. In the case of vehicle manufacturing, it only takes one missing part to stop an entire production line. This mechanism eventually spreads rapidly throughout the supply chain.

³¹Ibid.,41

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➤ China at the heart of automotive production and the Covid-19 crisis:

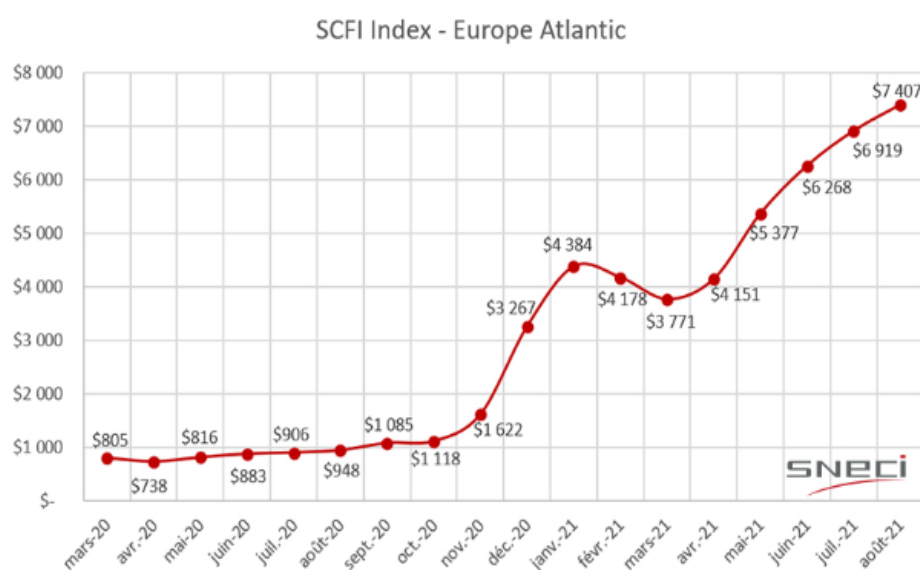
The Covid-19 crisis has severely disrupted Chinese businesses, including many major automotive parts producers. Wuhan alone concentrates 9% of the country's automotive production, and the city is home to hundreds of automotive suppliers.

As a result of the health crisis, local production slowed down and eventually stopped. Factories closed, and stocks piled up as they could not be shipped to the rest of the world. Indeed, delivery of various stocks was disrupted due to a lack of transport modes.

Many airlines suspended flights to and from China, and cargo-plane movement was restricted. Travel within the country was strictly controlled, making it difficult for companies to access ports and, ultimately, customers; delivery trucks were able to leave some cities but could be prevented from returning due to restrictions imposed by Chinese authorities.

The shipping industry was greatly affected by the economic crisis, with container carriers and producers reducing their fleets on trade routes by 30%. As for the rest of the containers were sent to the United States, where activities related to automotive production continued with the same dynamism in accordance with the “America First” policy of former United States President Donald Trump. This situation quickly led to a shortage of containers in Europe, as demand gradually started to pick up. Moreover, European carmakers had to deal with an unprecedented rise in the price of maritime transport, which has increased eightfold, with demand being much more significant than supply.

Figure(2;1): containers price rise in Europe :



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Source: SNECI.

A supply chain disruption in one country can quickly spread to the rest of the world. Such an outcome underscores a strong dependence of the European automotive industry on certain key actors from Asia.

Indeed, the major players that dominate battery manufacturing (including those equipping electric cars) are LG Energy Solutions, CATL, Panasonic, BYD, Samsung SDI, and SK Innovations. These are mainly companies based in China, Japan, or South Korea. Some of them supply to car manufacturers such as Renault, Mercedes, and Volkswagen. The latter, unable to receive the necessary parts, were forced to stop their production as well. Therefore, the interruption of their production directly impacts the activities of European OEMs.³²

➤ Production plants in full and/or partial shutdown across Europe:

Due to the pandemic, European automakers were temporarily forced to suspend production on certain models. Many of them had to close their factories and production lines permanently or for extended periods of time.

The French carmaker Renault had to close 12 production sites in France in March 2020, which impacted the jobs of over 18,000 employees. Such restrictive measures were also extended to its production plants abroad (Spain, Morocco, and Portugal). Indeed, Renault had to protect its employees in this particular context and comply with the sanitary measures imposed by the French and other governments. Later on, the company had to slow down and even close more of its production lines due to a substantial decrease in consumer demand.

On the German side, BMW had closed several of its factories in Europe and South Africa. Volkswagen was also forced to shut down its assembly lines to “continuously align production with expected market fluctuations”. As for Audi, the brand had to suspend the majority of its production in Europe, alongside the activity of certain administrative services. This suspension was mainly applied to car, van, and utility vehicle factories.

European carmakers are still struggling to resume their regular activity. This has become even harder following the semiconductor crisis the automotive industry faces today.

³² Covid-19: Its impact on the automotive supply chain and lessons learned(online), Available at <<https://www.sneci.com/blog/covid-19-its-impact-on-the-automotive-supply-chain-and-lessons-learned/>>,consulted on (05/20/2022).

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➤ The semiconductor supply crisis:

The Covid-19 crisis has weakened the automotive supply chain, which is currently experiencing a significant shortage of semiconductors, the electronic chips essential in any modern electronic system. A combination of several factors led to this severe crisis.

The automotive industry faced a fall in demand in the first half of 2020. At the same time, the switch to work-from-home due to sanitary measures and the increased need for connectivity led to a considerable rise in demand for electronic equipment (personal computers, video games, communication means). The production of these appliances requires many semiconductors. Consequently, companies producing chips redirected their efforts from automotive to tech sector production, which proved to be more profitable. When demand from the automotive sector picked up faster than expected in the second half of 2020, semiconductor companies had already redirected most of their production capacity toward other fields with greater demand.

This shortage had direct consequences on car manufacturers. In March 2021, a fire at the Naka plant in Japan owned by Renesas Electronics (one of the three largest semiconductor suppliers) caused more damage than expected. Because of this shortage, Stellaris predicted that 1,400,000 vehicles would not be produced in 2021. Ford announced that its production capacity would be cut in half in the second quarter of 2021 for the same reason. The American giant General Motors has estimated that the shortage of semiconductors could cost the company between 1.5 and 2 billion dollars. In September 2021, Toyota—which until was not affected by this crisis—announced a reduction in its global production of 40% compared to what it had expected (900,000 cars) due to a deficit of automotive parts." This semiconductor shortage revealed the vulnerability of the automotive industry to various crises or supply chain disruptions alongside its heavy dependence on key chip producers.³³

➤ Towards a better resilience of the automotive supply chain:

Several measures can be taken to reduce the risks associated with the automotive supply chain. First, relocating the supply sources and manufacturing of automotive parts to the same geographic area with the final client (carmaker) would make sense. Doing so would give

³³ Ibid.,47

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automotive actors more real-time visibility throughout the supply chain. Some production sites could also be partially moved from Asia to Eastern Europe. Moreover, coherent risk management practices must be implemented across all actors in the supply chain. The Covid-19 crisis has underlined this need for practical risk management approaches among all actors involved in the chain.

➤ Prospects for the automotive industry recovery:

In the long term, the automotive industry will have to rethink how it structures and deals with semiconductor supply contracts. This can be achieved through the establishment of a more balanced risk-sharing plan aligned with the entire value chain. Moreover, manufacturers should reconsider the current “just in time” practice. It will include opting for a regional supply to reduce their dependence on suppliers having a particular monopoly or being geographically far away.

To conclude, it seems more than ever necessary that various automotive actors opt for a cooperative approach and share common objectives to develop solid strategies, supporting a faster industry recovery.³⁴

³⁴ *ibid.*,47

Section 02: Risk management and agile risk management during Covid-19

Risk management represents a vital process for the survival of businesses and maximising organizational success, and it is also a critical key during the Covid-19 era for the automotive industry, most specifically the automotive supply chain.

Agility is a new concept added to traditional risk management to add a quick and efficient reaction in the face of the global health crisis.

1. Risk management overview

The search for risk management solutions immediately leads to fundamental definitional issues. There is still no general agreement on the subject's boundaries, and it is notoriously tricky, as with all management concepts, to formulate a single satisfactory definition of risk management. There are many definitions of risk, just as there are many definitions of risk management. In general, risk management is implementing tools and measures that allow organizations to navigate risk to keep their operations running smoothly. It enables them to implement a risk prevention and risk management strategy.

1.1 Definition of risk management

Risk management can be defined as a preliminary attempt based on a fusion. Risk management has a variety of origins and is practised by a wide range of professionals. It begins with an examination of all relevant information, particularly the combined risk assessment, which includes both risk assessment and concern assessment, and is based on risk perception studies, economic impact assessments, and scientific characterization of social reactions to risk sources ³⁵(T. Aven, and O. Renn, 2010). These data and the judgments made during the risk characterization and evaluation phases form the foundation upon which risk management options are appreciated, evaluated, and chosen. Risk management can be defined, as a first attempt based on a synthesis of definitions proposed by several authors, as a continuous planned and structured process aimed at assisting managers in making the right decision at the right time to identify, classify, and manage risks.

³⁵Aven, Terje, and Ortwin Renn. Risk management and governance: Concepts, guidelines and applications. Vol. 16. Springer Science & Business Media, 2010. Available at <<https://books.google.dz/>>.consulted on(05/20/2022).

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Quantifying risks, then managing and controlling them In the following table, we will attempt to present the most relevant and widely used risk management definitions:

Table (2;1): risk management definition:

Organisation / Author	Definition
Bahamid & al, 2017	Risk management is the systematic process of analyzing, identifying, and responding to the risks. It increases the possibility and impact of positive events while decreasing the likelihood and impact of adverse events to achieve goals.
Matthew P. Thompson & al, 2016	Risk management is a collection of coordinated processes and activities that identify, monitor, evaluate, prioritize, and control an organization's risks.
ISO 31000	Risk management is the set of coordinated activities to direct and control an organisation concerning risks. In this definition, coordination is about organising the conditions for dealing with risks within the organisation and deriving the best solution for the stakeholders' interests (Seiji Abe & al, 2018).
Institute of Risk Management (IRM)	The process intends to assist organizations in understanding, evaluating, and acting on all of their risks to increase the possibility of success and decrease the probability of failure (Paul Hopkin, 2010).
HM Treasury	All processes are involved in identifying, evaluating, and judging risks, assigning responsibility, implementing measures to mitigate or anticipate risks, and tracking and revising progress (Paul Hopkin, 2010).
Business Continuity Institute	Risk management is the culture, processes, and structures put in place to effectively manage potential opportunities and negative consequences (Paul Hopkin, 2010).
Tony Merna & al, 2008	Risk management is a systematic process for identifying, assessing, planning and controlling risks.
Committee of Sponsoring Organizations of the Treadway Commission (COSO II report,	a process implemented by the administration council, general direction, management, and the organization's entire workforce. It is considered in the development of the strategy and all organizational activities. It is intended to identify potential events that may impact the organisation and manage risks. It aims to provide reasonable assurance about achieving the organization's goals (Daniel Zéghal & al, 2009).

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2004) suite du (COSO Report I, 1992)	
Merna & Smith, 1996	Risk management can be defined as a collection of actions individuals or businesses take to mitigate the risks associated with their activities.

SOURCE: Adopted from: ALAOUI.M., DHIBA.Y., (2022) ³⁶

1.2 Why risk management is so important:

Risk management is an essential process since it provides a business with the tools it needs to identify and manage potential risks. It is much easier to mitigate risk once it has been identified. Furthermore, risk management provides a foundation for sound decision-making in a business.

This process best prepares a business for unforeseen events that may impede progress and growth. When a company evaluates its plan for dealing with potential threats and then develops structures to deal with them, it increases its possibility of becoming a successful entity. Moreover, progressive risk management ensures that high-priority risks are dealt with as aggressively as possible.

We can summarize why should every economic actor should implement risk management in four points:

- It Helps to Reduce Uncertainty: Uncertainty is disadvantageous to business and, by definition, difficult to quantify. However, Warren Buffett once stated, "risk comes from not knowing what you are doing." Understanding any business organization's internal and external aspects is essential to know how to protect it.
- It is Crucial for Successful Planning: Business success occasionally occurs by chance; instead, it results from meticulous planning and diligent execution. Unforeseen events can harm the success of a business by not planning them. If risk management is

³⁶ ALAOUI.M., DHIBA.Y. , Theoretical framework for risk management; International Journal of Accounting, Finance, Auditing, Management, and Economic, 2022. p132, Available at <<https://doi.org/10.5281/zenodo.5910114>>, (consulted on 05/16/2022), translated.

wholly disregarded, everything done will have a high chance of failing. Consider the following scenario: failure to identify a workplace safety hazard. If an accident occurs, it could result in worker injury, decreased productivity, and, most likely, a costly lawsuit.

- It helps Reduce Expenses and Losses: Income and expense risk are the two main types of risks facing finances. Any events or mishaps that reduce your productivity – or the ability to serve clients – will result in a loss of income. Developments that increase the cost of production or other overhead parts are also considered expense risks and can manifest in various ways. A change in legislation, for example, could result in higher taxes or compliance costs; alternatively, increased competition could result in higher marketing costs.
- It Helps Improve the Reputation: A proper risk management strategy in place aids in conveying a positive message about the company. It demonstrates that the company is solid and dependable and values a professional culture that can continue to get the job done even when things go wrong. Internally, it instils trust in the employees about the leadership's abilities; after all, having a safe workplace helps to boost morale. The organization's ability to continue providing client services when disaster strikes will significantly impact the brand.³⁷

2. Agile risk management

The way agile projects manage risks is referred to as agile risk management. Comprehensive frameworks for predictive projects, such as the Project Management Institutes' standards, recommend a variety of processes, tools, and techniques for managing project risks.³⁸ Some principles in agile risk management align with the values inherent in most agile methodologies, such as openness, respect, and courage. They reflect features such as communication and collaboration found in the agile manifesto's principles:

- **Transparency:** All risk-related activities and artefacts should be visible to everyone on the team. We propose that these be placed next to other agile tracking and reporting tools (e.g., burndown charts, Kanban board) or in a central project area (e.g., information radiator). Team

³⁷ PREETAM,K, Why Is Risk Management So Important in Business?,starting business magazine,june 06 2020,Available at (<https://www.startingbusiness.com/blog/risk-management-importance>).consulted on(05/20/2022).

³⁸< <https://agileriskmanagement.org/agile-risk-management/>>.consulted on(05/20/2022).

members can add to or annotate them. This is known as risk walling, which means that someone from outside the project could walk into the project area and assess the risk situation without asking or interrupting team members.

- Balance: Risk management is all about balancing risk and reward and figuring out how to generate the same amount of value with less risk. As a result, it should be obvious which user stories are the riskiest and how individual team members' work contributes to risk mitigation by either reducing threats or exploiting opportunities.
- Flow: Risks are unavoidable, but understanding and dealing with them allows the project to continue without significant disruption.

2.1 Agile risk management process:

Agile risk management can be presented as a implies to risk tailor existing dexterous techniques and hones in a way reliable with the original spirit of the dexterous pronouncement and in line with the hazard setting in which a specific project finds itself. Hence, the method draws on extending venture risk management components and applies them fittingly to dexterous venture administration.

- Risk scoping: Identifying risk drivers and appetite.

A shared understanding of risk using the endeavour risk driver outline is essential to evaluate how the drivers affect a particular extent. Such talks included the venture support, team members, and other essential partners who endeavoured to pick up a shared understanding of risk. An encouraging workshop would be the appropriate forum for such a dialogue. Alternatively, a longer-term methodology to decrease such specialized risk would be constructing versatile app development abilities in-house. Hence the thought is to energize a genuine evaluation of who is doing the extension and whether preconditions ought to be met sometime recently the project is affirmed.

With the risk of disappointment (or victory). Ought to the project risk driver outline show that the venture is on the enterprise boundaries of unfortunate chance at that point this will have results for how the to extend is conducted. It may be essential to select suitable devices reliable with risk-driven approaches as depicted in (Laurel and Fairbanks 2010), which advocate that the determination and application of procedures be spurred by chance and be commensurate. For illustration, if creating an application that must provide a tall execution

employing a new algorithm at that point, it may be fundamental to invest more intensely in test-driven improvement throughout the extension.

- Risk Tailoring: Embed risk management in an agile process.

The next stage of the agile risk management process involves making project-specific changes to the agile methodology, which can only be done if the project's risks have already been identified during the risk scoping stage. We have not explicitly considered which until this point in the process. However, given the agile methodology we are employing, it is now necessary to consider the particulars of our chosen methodology.

Having an agile chart for the software development process is a valuable communication tool in and of itself, as it promotes a better understanding of the cyclical nature of activities. It clarifies when and how frequently specific activities are expected to occur. Indeed, this impacts how risk management is carried out (for example, does most planning take place at the incremental or iterative level, and when should risk assessment activities take place?).

- Risk management: Mostly, this entails using traditional risk management techniques with some agile adaptations. The primary goal of risk management is to improve understanding of risk and return and support decision-making in this regard within the project context.

It is recommended to keep a risk list that underpins all risk-based activities and includes the attributes listed in Table (2;2) throughout the risk management process:³⁹

³⁹ A.Moran ,Agile Risk Management, SpringerBriefs in Computer Science,2014,Available at <https://link-springer-com.snd11.arn.dz/content/pdf/10.1007/978-3-319-05008-9_3>, consulted on(05/20/2022).

Table (2;2): Common risk list attributes adapted for the agile context:

Attribute	Description
Identifier (optional)	Code or name identifier with which the risk may be referred. Unless this is used somewhere, it ought to be considered optional.
Description	Description of the precise nature of the risk as elicited in the risk identification phase. The use of a risk statement (see below) is highly encouraged.
Classification(optional)	Placement of the risk in some form of categorization. Typically this is based on risk drivers though the project may choose to derive a classification based on other factors. Once again, this should only be used if considered beneficial (e.g., tracking based on category). Otherwise, it should be dropped.
Likelihood	The probability with which the risk event is likely to occur or its proxy, frequency (with respect to a specific timeframe). This information can only be gathered during the risk analysis stage.
Impact	The impact the risk event, should it occur, is likely to have. This information can only be gathered during the risk analysis stage.
Score	The risk score is assigned based on likelihood and impact
Strategy	The risk strategy is to be adopted in order to manage the risk. This information can only be gathered during the risk management stage
Measure	The measures (if any) to be taken to address the risk. Note that a reference to a measure can be a task (e.g., introduce redundancy into the storage), in which case a risk task as described later must be included on the backlog, or it may concern the way something is done (e.g., all GUI related tasks must use pair programming) in which case it ought to be flagged up in a manner that all are reminded of it (e.g., risk tagging)
Residual likelihood	The resultant likelihood of the risk event once the measure has been implemented.
Residual impact	The resultant impact of the risk event once the measure has been implemented
Residual score	The risk score is assigned on the basis of residual likelihood and impact.

SOURCE: A. Moran,2014.⁴⁰

a. Risk identification:

Risk identification is deciding the most vulnerabilities that could potentially impact the project objectives (positive or negative). Note that it is not fundamental to distinguish each

⁴⁰ Ibid.,55

potential source of vulnerability. The project risk drivers constitute a good starting point for risk identification though other risks may also be found. This requires experience, judgment, and attention to some of the subtleties of risk identification.

b. Risk Analysis and Prioritization:

Risk assessment involves estimating both the likelihood and the impact of risks. Once the risk is identified, it is necessary to evaluate and prioritize them. Note that impact assessment should be in terms of project objectives and that these may already have been prioritized, which should have a bearing on the risk assessment. Tracking risk requires that risk assessments be reduced to a comparable basis. Risk exposure would appear to provide a reasonable means of achieving this. However, the fact that risk components are not always quantifiable but may be ordinal means that exposure may not make much sense.

c. Risk Treatment:

Risk treatment involves selecting response strategies to the risk and determining the nature of measures taken to decrease the risk. This, in turn, informs the specific measures to be undertaken in the risk activity.

There are plenty of tools, techniques, and approaches for agile risk management :

- ROAM Board.
- Monte Carlo Analysis.
- Risk Burndown Chart.
- Risk Register or Log.
- Risk Modified Kanban Board.
- Risk Probability and Impact Matrix.
- Prioritizing Backlogs based on Value and Risk.⁴¹
- Identifying / Discussing Risks in Regular Meetings.

⁴¹ Kožul.k, Applying Agile Risk Management, Available at <<https://serengetitech.com/tech/applying-agile-risk-management/>>, consulted on(05/23/2022).

2.2 Agile risk management in the supply chain:

Supply chain Risks are becoming more severe and unexpected, such as natural phenomena or health crises, requiring more agile strategies and management.

Those risk management activities need to function at the speed of change – the speed of risk and the speed of supply chain operations.

The purpose of risk management is what true north is to navigation. Why? A risk is simply a thing which can stop or slow down operations on to a given objective. Some risks are worth taking for a given supply chain objective, and some are not. The process of deciding what to do is called managing risk, which SC managers do daily. On the journey from point A to point B, the need to know when to speed up, when to slow down, or when it should stop and plan another route altogether.

Supply chain agility is described as being able to react to sudden and unexpected market changes. Agility is critical because, in most industries, both demand and supply fluctuate more rapidly and widely than they used to. Most supply chains cope by playing speed against costs, but agile ones respond quickly and cost-efficiently⁴².

Supply chain agility becomes the key to adapting to market variations more efficiently by integrating with suppliers more effectively. As more companies pursue production capability by outsourcing or off-shoring, explicit risk factors increase.

The connection between agility and risk is implied in many different references. We suggest that using agility as a response to risk needs to be addressed more explicitly.

The need for backup plans to deal with supply disruptions is one indication of risk management for the supply chain. Supply chain events occur when supply disruptions occur, and these events require those backup plans or detailed contingency plans. By subdividing risk and then matching each risk element category with appropriate agile strategies, we believe supply chain issues will be addressed more effectively. This approach of using agility to address the full spectrum of supply chain risk proactively is what we suggest is a framework that we might also call design for supply chain agility.

⁴² Lee, Hau L., "The Triple-A Supply Chain", Harvard Business Review, October, 2004.

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Furthermore, there is no doubt that emerging technology is a crucial enabler of agility when it enables businesses to serve customers better, faster, cheaper, or at scale. It can also assist them in embedding agile processes internally by utilizing tools (such as Slack) that bridge the efficacy gap between in-person and remote collaboration.

Creating and sustaining agility necessitates technology and the right human capital. Before leveraging technology, organizations should invest in developing leaders with the necessary skill sets and mindsets to face the looming existential challenges. The talent pool is brimming with potential future leaders inside and outside the supply chain. However, seeding the entire organization with these competencies may necessitate proactive, imaginative scanning at all levels of the supply chain.

Talent development is a great place to start for companies looking to build agility and resilience. Indeed, the most foresighted and innovative leaders recently spoken with are increasingly concerned with upskilling and holistic growth that extends beyond their core business functions. They are eager to learn everything about business, leadership, and technology. Moreover, they increasingly realize that learning must be a lifelong core competency rather than sporadic or one-time in today's uncertain world.

2.3 The importance of agility during covid-19:

COVID-19 created chaos in global supply chains. However, they have also been a critical lifeline for the response, ensuring that critical medical supplies, food, and other necessities get to where they are needed. There is no doubt that the pandemic has put supply chain leaders worldwide to the test as they try to keep critical operations running.

The virus was a live threat, and several regions and economies were under lockdown; while others emerged into a very different world, the disruption to supply chains remains severe. As economies recover, the supply chain will be critical to quickly, safely, and securely delivering goods and services.

Businesses must make rapid decisions and take immediate action to maintain business operations, serve customers, clients, and communities, and protect and support their employees. Fundamental shifts in consumer behaviour, supply chains, and market access are throwing businesses off balance. Responding to the pandemic has highlighted the importance

of leaders accelerating the adoption of agile ways of working and value chain transformation to help navigate uncertainty; agile risk management during that period is inevitable.

COVID-19 is not an average risk event. The magnitude of its impact dwarfs anything most supply chain leaders have seen before. The rapid escalation necessitates continuous end-to-end assessment, optimization, and monitoring. Companies must respond quickly and confidently to shape and execute a short-term tactical plan that will mitigate risks to human health and protect global supply chains. In order to understand complexity, reliable data and analytics capabilities are required, anticipating potential disruption and quickly developing a response.

Businesses need to navigate the financial and operational challenges posed by the coronavirus while responding quickly to the needs of their employees, customers, and suppliers. Supply chain leaders can transform massive complexity and supply chain disruption into meaningful change by taking the right actions.

Fast decisions concerning risks that appeared during the health crisis are called agile risk management.

2.4 Risk management in automotive supply chain and why agility is so vital during Covid-19:

The car supply chain is complex owing to the vast number of parts gathered into a car, the different layers of providers to supply those parts, and the coordination of materials, data, and budgetary streams over the supply chain. Over the past decades, car supply chains have been stricken and disturbed repeatedly by common and human-made calamities, such as seismic tremors, tsunamis, typhoons, strikes, economic emergencies, SARS, plant fires and blasts, fear monger assaults, and other disruptive events. Such supply chain disturbances can adversely affect a firm's short-term performance. At the same time, car commerce has become progressively more complex as globalization has become an industry standard. Other unused hones include just-in-time (JIT) conveyance, incline to fabricate or incline generation (Nakashima & Sornmanapong, 2013), and provider union. As a result, automotive supply chains have gotten to be progressive.⁴³

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With fast development and technology, the complexity of the automotive supply chain caused the risks to be even more unpredictable. The automotive business needed to opt for an agile approach concerning risk. Using secure and accessible project management and communications tools familiar to all team members increases efficiency and decision-making agility. Data is being generated increasingly by increasingly connected consumers, factories, automobiles, and supply chains. Manufacturers can reduce business risk and become more agile by identifying potential supply issues, increasing efficiencies, and providing customers with more accurate timelines. For example, predictive analytics can assist manufacturers in answering "What if?" questions and proactively mitigating the impact of potential supply chain disruptions. Digital traceability allows managers to track vehicles and their components as they move through the supply chain, providing precise information on the origin of inputs, supplier sourcing practices, and conversion processes. Customers expect real-time visibility into when an automobile will be delivered to them, as well as the status of service, spare parts, and accessories, also risks that may appear and react immediately to them.

Automotive Manufacturers begin to move toward a sentient supply chain as they modernize the supply chain to make it more agile and resilient. A sentient supply chain can sense, process, and respond in real-time. Sentience is helpful in several supply chain areas, including planning, insight, traceability, analytics, and asset and inventory management. For example, a sentient supply chain can detect when inventory needs to be moved between factories and take appropriate actions, or at the very least make recommendations that must be approved.

It is difficult to predict when such digital intelligence will be fully formed. However, experts agree that the next decade could see one of the most significant technological disruptions in the global automotive industry as the line between tech and auto companies becomes increasingly blurred. The development of self-driving and electric vehicles will bring in new players and significantly alter supply chain practices in the automotive industry. With globalization, disruptive technologies, shifting consumer demands, and changes in manufacturing processes, the automotive supply chain is likely to encounter some stumbling blocks. Optimizing supply chain visibility is critical for increasing production efficiency and

⁴³Nakashima, K., & Sornmanapong, T. (2013). A study on semiconductor supply chain management in the automotive industry. *Journal of Japan Industrial Management Association*, 64(2), 284-292, Available at < https://www.researchgate.net/publication/288251596_Stochastic_inventory_control_systems_with_consideration_for_the_cost_factors_based_on_EBIT>. consulted on(05/20/2022).

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shortening time-to-market. Furthermore, automakers may need to adopt and adapt to new cloud, AI, and robotics technologies. AI, data analytics, machine learning, and IoT ensure that their suppliers' new ecosystem will be transparent, agile, and resilient to global volatilities.

In the end, we can summarize the agile risk management intervention during the covid-19 in some important notes:

Leaders must learn to let go in order for this approach to work. Because of the pandemic's fast-paced and, at times, erratic nature, leaders have had to be adaptable in terms of shifting expectations.

Newly agile leaders must foster a culture of experimentation and learn in their organizations and an environment where employees can make mistakes without fear of repercussions.

The ability to remain calm under pressure, be open to new ideas and keep teams grounded and on track; individuals are prioritized over processes.

Collaboration at all levels has been critical, with all employees; stakeholders; working toward the same goal – the organization's survival and advancement. In the best cases, teams have enjoyed greater freedom to think and act autonomously while delivering a great customer experience by aligning – or, perhaps more accurately, re-aligning – their work with organizational purpose, strategy, and priorities.

Also, one of the benefits of creating a collaboration workshop is to increase diversity in thoughts and ideas to overcome the risk that appeared during the corona health crisis; collaboration was vital during that period, especially since it's the first of its kind and its consequences were heavy on the function of the supply chain.

Visibility provides information about the risk management operation progress. It is available to key stakeholders in an agile environment and to end-users who participate in a continuous cycle of feedback, acceptance testing, and iteration demos.

Using agile risk management needs to be ubiquitous and continue to increase efficiency and limit the risk that may appear in the future. Of course, when it comes to covid-19, no one would have known when it would disappear or if it was divided into periods or waves; this is why agile risk management needs to be ubiquitous.

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All risk information agile mitigation processes must be shared at the steering committee level...

Agile risk management tools can be used with the agile team and help manage the risks at a higher level.

The conclusion of the chapter

As we mentioned in the chapter above, the global health crisis had enormous consequences on the function of the automotive supply chain.

However, it is noted that the response to a pandemic represented a unique set of circumstances. The element may be there, but the traditional elements of an emergency preparedness strategy do not apply in response to a pandemic.

Change risk management for implementing the plan will be slow and complex; additionally, the risks and dynamics may change one year into the pandemic or every once in a wave and require different risk management approaches such as agile methodology.

Chapter03:

The covid-19 impact on Renault Algeria (the delivery centre) and the integration of agile risk management.

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Introduction of the chapter

The two previous chapters, which constitute the theoretical part of our research, must be completed by the practical part, which is an essential component of any study since it allows us to test and verify our already proposed hypotheses.

In this practical part, we will present two sections: the presentation of the Renault company, and we will try to analyse whether the CLV implemented the agile risk management during the pandemic.

Section one: Automotive market in ALGERIA and Renault presentation.

1. Automotive market in ALGERIA

Algeria knew large and numerous investments in the field of car assembly through Algeria's car import activity witnessed several modifications, as several orders were issued.

Laws and decrees to regulate this activity and protect the national economy, the government thought that critical decisions had been taken to reduce the annual import bill for SKD/CKD directed groups to install tourist cars.

However, that did not stop Algeria from making a foreign partnership with some of the most crucial manufacturing brands globally - Renault, Peugeot, Volkswagen, and Kia.

Apart from Renault, we will introduce later:

Volkswagen: The factory for the assembly of German brand Volkswagen cars was inaugurated in the municipality of Mr Khattab, in the state of Guelizian, for the installation of four types of cars: Seat, Ibiza, Skoda Octavia, Golf 2 and Cadi, in partnership between the Algerian boat Sovac and the German company.

The SOVAC Complex announced that the sale of installed cars would be 21% cheaper than imported, and this is the first factory in North Africa and the second in Africa after a factory in South Africa.

The President and General Manager of the SOVAC Complex, Murat Olami, said that the factory would work to revive the handling activity, produce spare parts locally, and then export abroad at a later stage.

Peugeot: Algeria and France signed on November 2012 an agreement between the PMO Constituency Constantine and the Congregation CONDOR, Pro Palpa and PSA Peugeot, Algeria. The company's capital is distributed according to the rule of 16/50% between 21% of the National Corporation for the Production of Machines Industrial Algeria PMO Constantine and 5.05% for the CONDOR private group, and 5.05% for a pharmaceutical dealer Algerian (Palpa Pro) for the Algerian side and 16% for the PSA complex for the French side.

As for the percentage of integration, it is 11%, and the contract also provides for establishing the PSA Academy in Algeria.

Which can contribute to the development of the competencies of the Algerian workforce in the field of car assembly and manufacturing for Peugeot Citroen Production Algeria

Kia: The Global Group of Algeria in the Germa region of Batna inaugurated a new factory for cars under the brand Kia, which has international specifications and considers safety and quality standards, and marks will be produced and installed Picanto, Rio, Cerato and Sportage. This factory employs 2,111 workers in its initial stage, and there will be job opportunities in the industrialisation stage. An increase of more than 5,111 workers while raising the national integration rate to more than 11%.

Those are not the only existing automotive companies in Algeria. There are others, such as Suzuki, Mercedes-Benz, Ford and so on, which increased the competitiveness In the Algerian market.

2. Renault Overview

2.1 Renault presentation

Renault group is an international company with French roots and a 120-year history. Present in 128 countries.

This automotive brand design manufactures and markets passenger and commercial vehicles sold under Renault, Dacia, and RSM. As a result of their unique alliance with Nissan and their strategic partnerships, they are the fourth largest car manufacturer globally.

Today more than 120,000 employees worldwide work under Renault's name, all driven by the same passion: L'AUTOMOBILE.

2.1.1 History of Renault :

➤ from a man's business to an international group :

Louis Renault:

Born on February 12, 1877, in the eighth arrondissement of Paris¹ and died on October 24, 1944, in the prison of Fresnes near Paris, he is a French inventor, racing driver and entrepreneur pioneer emblematic founder of the French automotive industry with the industrial empire Renault². With his company, he contributed intensively to the war effort during the conflict of 1914-1918.

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- 1898-1918:

In 1898, brothers Louis and Marcel Renault founded their company. Thanks to its small cars, the company quickly made a name in motor racing. In 1905, the Renault factories adopted mass production techniques, and in 1913 they adopted Taylorism. During World War I (1914-1918), the company produced trucks, stretchers, ambulances, shells and FT17 tanks that played an essential role in the final victory.

- 1919-1945:

In 1929, Renault modernized its premises, starting the first production line at Billancourt. The firm tried to keep costs down to weather the economic crisis, but social conditions deteriorated. Louis Renault was a pacifist and opposed Germany's invasion of France. In 1940 he gave in to German demands and allowed them to take over his factories; as a result, Renault was nationalized in 1945, becoming the Régie Nationale des Usines Renault (RNUR).

- 1945-1975:

Renault, a French corporation, modernized its plants, built new production sites, and bought existing ones. Its first small car for everybody was the Renault 4CV, followed by the Renault 4 and then the Renault 5 (which remains popular today). Next came an upmarket model called the Renault 16, which became known as the first "voiture à vivre" ("car for living") because of its impressive comfort levels. Renault's attempt to conquer the US market failed; nevertheless, it continued expanding into other countries. At the same time, Renault achieved impressive rally racing results.

- 1975-1992:

The company continued to grow until the early 1980s. In the early 1980s, Renault launched two upscale models: the Renault 25 and Espace. The brand also made its mark in motorsports and entered Formula 1. However, Renault was losing money heavily. By instituting a drastic cost-cutting policy and refocusing on its core skills, Renault returned to profitability by 1987.

- 1992-2005:

In 1993, Renault considered merging with Volvo, but the project was dropped. In 1996, the company was privatized, and it took advantage of its newfound freedom by taking a stake in Nissan in 1999. In 2000, Renault continued to innovate and renew its range of vehicles,

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including Mégane and Laguna. It then won Formula 1 races and raised the profile of the Renault brand throughout the world. The Renault-Nissan partnership consolidated its structure and continued to develop new synergies with acquisitions such as Samsung Motors and Dacia. With the introduction of Logan in 2005, Renault sought to win over consumers in emerging markets.

The international Group:

On March 27, 1999, following an agreement signed between Renault and Nissan, Renault acquired a stake in Nissan. This is the alliance. The binational Group Renault / Nissan was the third-largest automotive Group globally in 2016.

The Renault Group is an international multi-brand group including the Renault, Dacia and RSM brands. Renault is strengthening its penetration potential in new markets and developing its profitable growth strategy. Present in 127 countries, the Group sold nearly 3.2 million vehicles in 2016 and is now the leading French automotive Group globally. With a renewed range and the development of its international activities, the Renault Group is strengthening its growth ambitions in 2017.

The Renault Group is also preparing the future electric, connected, and autonomous vehicle. Renault is making motorsports a vehicle for innovation and brand awareness with a new Formula 1 team and a solid commitment to Formula E.

The chronological frieze:

1898 The first Renault car
Light and well designed : it
is modern and one of a kind.

1905 Renault Type AG 1, 8 horses. But
without the horses. Second industrial
revolution. The carriage disappears,
Renault invents the first modern taxi.

1932 During 'la Belle Epoque,
we could have created Renault
Talisman ... But at the time, the
height of the roof of the Nervastella
was more suitable.

1946 the Second World
War is over. Renault is
launching a car accessible
to everyone to get away on
the roads and enjoy again. 4
horses, 4 doors, to race to
the 4 corners of the country!

In the midst of economic growth, it was
useful to know how to adapt

In **1959** Europe is experiencing an
economic boom. The economy is only
getting stronger and Renault is
accompanying this growth with a
suitable van: the Renault Estafette!

1966 During the Baby
Boom, Renault Twizy could
have been created... But at
the time, the large boot of
the R16 was more suitable.

1973 It wasn't just the year of the
flowered wallpaper.

Oil crisis, Renault had to bite the bullet.
the company invented the revolutionary
car to continue enjoying life! Renault 5
and its 4.5L / 100 KM!

New era, new family, new car... the first MPV in history

In **1984** the family evolved. Renault creates a modular car adapted to all configurations... Renault Espace!

1992 A revolutionary city car

From the moment it was unveiled at the Paris Motor Show, Twingo caused a sensation. With its frog-like face and a design that dares to mix minivan and city car, it surprised and seduced. A contraction of the words "Twist", "Swing" and "Tango", Twingo was aimed at a young target group that quickly succumbed to its charm.

Launch of the Renault Safrane;

Replacing the R25, the Safrane was Renault's top-of-the-range model from its launch to the end of its production in 2000.

Electricity is not just a fad.

In **2012** the future is at the heart of Renault's concerns. The company wants to turn to renewable energies. It has created Zoe, a very agile electric car.
"Renault Zoe!".

Clio IV was unveiled at the Paris Motor Show;

Inspired by DeZir, Clio IV is the first vehicle to adopt Renault's new design identity.

2018 120 years of mobility

A new era is beginning in the world of transport and our vision remains the same: to ensure sustainable mobility for all, today and tomorrow.

mobility for all, today and tomorrow.

2.1.2 Renault's mission vision and goals:

➤ Renault's mission

"We make the heart of innovation beat so that mobility brings us closer together."

They believe in responsible and respectful progress for everyone.

Since 1898, Renault's history has been written by enthusiasts who design innovative vehicles rooted in popular culture to accompany our lives. Because mobility is a source of fulfilment and freedom, it wants to contribute to the progress it makes possible. This freedom of movement is compatible with the preservation of the planet. Therefore, the company acts to contribute to better living and limit its impact on the climate and resources. It is also committed to making progress to share safe mobility better.

With Renault, everyone can find their place and participate in a collective adventure. Attached to their diversity and French roots, their international presence brings the company a great openness to the world.

Its CSR strategy is thus the expression of this Raison of existence. It is based on three pillars: carbon neutrality, safety and inclusion.

1- Carbon neutrality "Green as a business":

Reducing our carbon footprint as a performance driver. reducing CO2 emissions over the entire life cycle of their vehicles to aim for carbon neutrality in Europe in 2040 and worldwide in 2050:

- With their suppliers.
- At their production sites.
- In use.
- At the end of life.

The company's carbon emissions are reduced from start to finish: purchased materials and components, production sites, vehicle emissions on the road, second life and recycling.

The entire vehicle life cycle is optimized to reduce our footprint.

2- Safety "Caring cars, caring company":

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Safety is a priority. They innovate and implement measures to ensure optimum safety for both vehicle users and employees.

a- Car safety:

They rely on a two-pronged strategy to make journeys safer: prevention and rescue.

- The prevention:

- Safety Score :

"Safety score" will help analyze driving data through sensors placed on the vehicle.

- Safety coach:

The "Safety coach" will inform drivers of potential risks on their journey based on surrounding data and signal high accident locations in real-time.

- Safe Guardian:

A relay can be automatically triggered in the event of a proven risk (too dangerous a turn, uncontrolled driving for a prolonged period, drowsiness, etc.). The vehicle will then slow down and automatically go to safety.

- The rescue:

- Fireman access

It facilitates the intervention of the fire brigade to deal with a fire on the batteries caused by accident. It considerably reduces the intervention time (from almost 2 hours to a few minutes).

- Rescue code:

The "QR code" allows firefighters to identify a vehicle and access its architecture information. At the same time, Renault Group has trained firefighters in 15 European countries to use the code and donated several hundred vehicles for their training courses.

b- Safety at work:

- Prevention campaigns:

- Medical prevention campaigns

for female cancers and cardiovascular diseases from 2021.

- Targeting zero work-related accidents and illnesses: work-related

- Medical coverage for all:

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Optimal medical coverage for 100% of the Group's employees. Access to remote medical consultation for 100% of employees by 2025.

3- Inclusion:

- "Giving chances":

We are carrying out our transformation in an inclusive manner. Renault Groupe is rethinking its organization to better adapt to each of its employees, ensure that well-being at work continues to progress and support the transformation of the automotive industry's businesses.

➤ **Renault vision :**

The growing demand for personal urban mobility other than the private car and existing public transport methods requires developing more effective clean, sustainable, and shared offers. Groupe Renault is working on developing various types of services to address this demand: carpooling, car-sharing, ride-hailing, and driverless vehicles. It is Renault's duty as a leader to promote this change.

Groupe Renault offers sustainable mobility solutions for people of all ages, from companies and the public sector, regardless of physical condition or financial situation. To develop these mobility solutions, Groupe Renault is working in open innovation model with its private and public partners, relying on the R&D resources of the Renault-Nissan-Mitsubishi Alliance. Thus, it continues its historical vocation of ongoing innovation to offer sustainable mobility solutions for everyone. With its trio of concept cars, the EZ-GO, EZ-PRO and EZ-ULTIMO, Groupe Renault has produced three bold and complementary responses that bear witness to a comprehensive vision of the future of shared mobility.

Groupe Renault's vision of sustainable mobility for all is to integrate its shared-mobility solutions into the city and the urban landscape to make them accessible to everyone. It envisages future cities as ecosystems capable of meeting everyone's needs to respond to this revolution. Affordable zero-emission vehicles will be available via direct ownership and on-demand sharing services.

The perception of vehicles will shift from being a status symbol or necessity to being seen as a service. This will result in minor construction of roads and more investment in solutions like electric vehicle (EV) charging stations and the intelligent grids needed to power them. New roads may not be necessary for cities: as car-sharing fleets take many private vehicles off the

road in urban areas, the no longer-fired roads will be transformed into much-needed public spaces.

2.2 Renault ALGERIA:

Renault ALGERIA is a company that is 100% a subsidiary of the Renault Group, the leader in the Algerian automotive market for 12 years. Over 700 in Algeria are committed to their company's performance, open and passionate about marketing vehicles and offering a quality after-sales service.

In 1922: Renault made its first appearance in ALGERIA through the Algerian Automotive Company Renault SADAR, which distributes its models.

In 1959: Pierre Dreyfus, CEO of Renault at the time, laid the foundation stone for the CARAL assembly plant, Renault Car constructions in Algeria, in El Harrach.

In 1969: CARAL and SADAR merged and produced mainly Renault 4, Renault 8 and Renault 4 minivans until their nationalization.

1987, SONACOME imported and distributed passenger and small commercial vehicles from 1969 to 1987. Renault returned in 1987 as a liaison office after the end of the Vehicle import Authorization contracts.

In 1997: Renault Algérie SPA was founded 1997. The company became operational in 1998 and moved to its historic headquarters in El Biar.

In 2011: Renault Algeria inaugurated its new headquarters in 2011 Oued Smar, where it will now have a complete Branch.

In 2012: Renault, SNVI and FNI signed the Renault Algérie Production industrial project agreement on December 29 2012, in the presence of the Presidents Mr Holland and Mr Bouteflika.

In 2015: In December 2015, Renault celebrated its ten years of leadership in the Algerian market with an exceptional year with more than 35% market share.

2.2.1 Renault ALGERIA objectives:

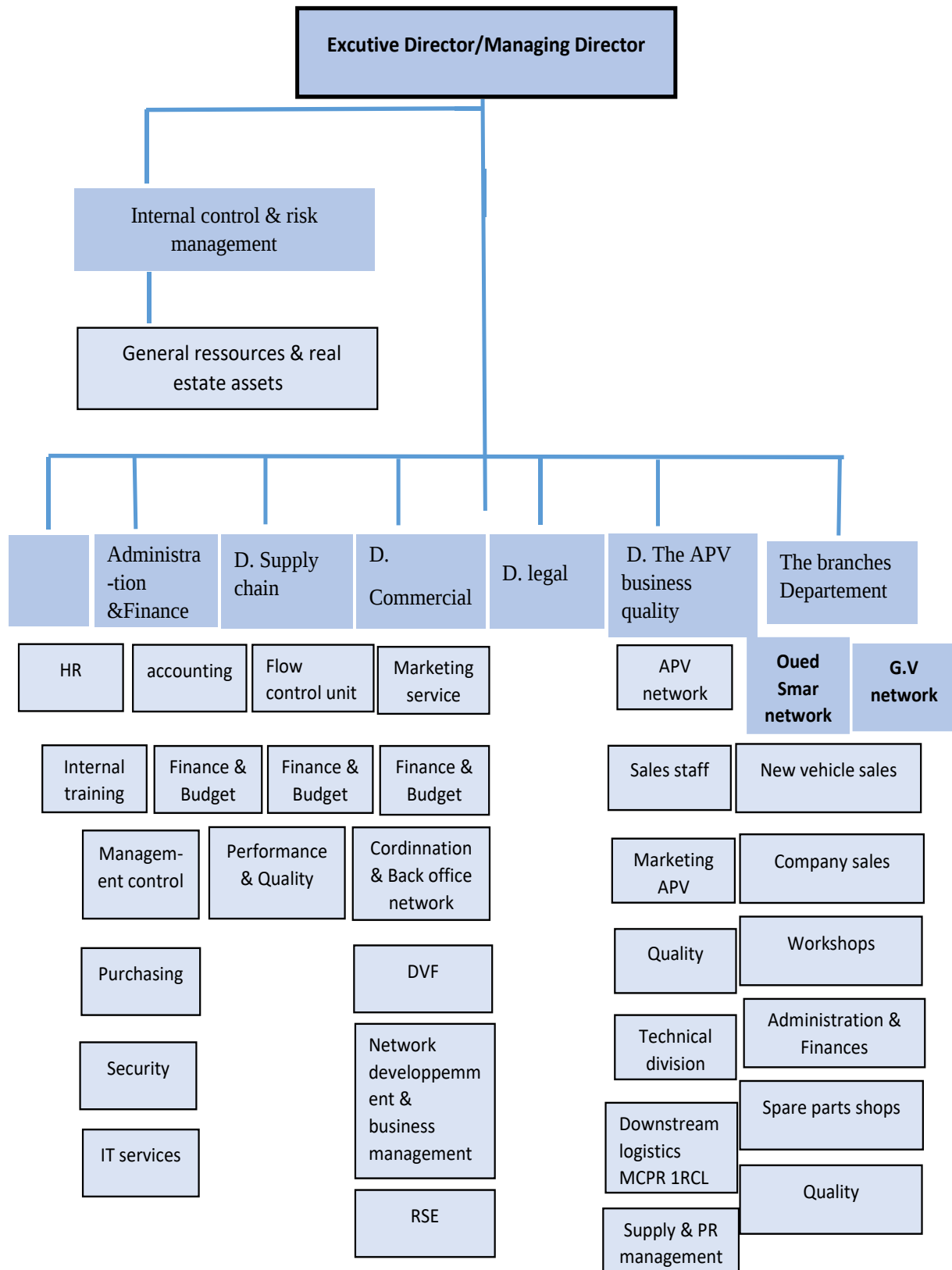
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Renault Algeria is just like any other company with goals they have to achieve, such as focusing on customer satisfaction and optimization of sales to face the fundamental problem of competition occupying the national market acquisition of a good positive image.

Coordinating and managing all the company's staff skills to improve the performance desired of each individual in the workforce.

Figure (3,1): Renault ALGERIA's Chart:

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SOURCE: internal documentation of Renault Algeria

Renault Algeria's main activity is the production and assembly of vehicles; it assures several services such as:

- Sales of new vehicles:

Renault was the first manufacturer to set up a car plant in the country in 2014, and the company makes available to its customers three ranges produced in Algeria "SYMBOL Made In Blade, SANDERO Step Way & the latest CLIO 4", and this through its network of distributors throughout the country.

- Sale of spare parts:

Renault Algeria has a central spare parts warehouse to serve its customers with a storage capacity of 18 000 references.

- After-sales service:

Renault Algeria ensures quality maintenance to its customers beyond the acquisition of its vehicle.

- Renault credit:

The vehicles manufactured in Algeria are now available on credit.

- Professional training:

Renault Algeria Academy; Training school for automotive professions.

Renault Algeria is also:

Renault ALGERIA entities

OUEDESEMAR Branch

GRANDSVENTS Branch

ORAN'S Branch

ALGIERS Delivery centre

ORAN shipping centre

The central spare parts store

RENAULTALGERIEACADEMY

Renault ALGERIA is three branches, two delivery centres, 1 central spare parts store, and an academy.

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Our research has focused on the downstream transportation of Renault ALGERIA at the Delivery centre in ALGIERS.

CLV is a delivery centre of Renault situated in ALGIERS Chéraga; its main activity is the storage of finished vehicles and their delivery.

According to our observation, we can summarise CLV's activities: reception, storage, preparation, and delivery of the finished vehicles to the final client.

CLV is an establishment composed of three teams :

- The performance team includes the quality, costs, and system staff.
- Preparation team.
- The logistics team includes the staff in charge of transport programming, transport, and delivery.

2.2.2 The function of transportation in Renault ALGERIA supply chain:

Transportation plays a significant role in Renault's supply chain. It focuses on planning, optimizing, and executing different kinds of vehicles to move the components or the finished assembled cars from the leading factories to the final client, whether it is an assembly factory or a delivery centre.

The transportation process can be divided into three main phases, where the last phase can be categorized into two different times because of the consequences of the health crisis where Renault had to change its distribution policy.

- **Phase 01:** Upstream procurement of spare parts and components.

This process is about moving the necessary parts and components that enter into the production and assembly phase from the suppliers who are the main factory of Renault in Romania, Turkey and France (since Renault is an international brand that has subsidiaries all around the globe); to the assembly factory of Renault ALGERIA in ORAN.

- **Phase 02:** Assembly.

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Phase two is about transferring valuable equipment or components from the storage warehouse to the assembly plant, depending on the structure or distance between the two. Then the finished vehicles are transferred to the delivery centre of ORAN (CLE).

- **Phase 03:** Downstream, the final distribution of vehicles.

The final phase is the distribution of the finished vehicles to the final client, and we will discuss this phase in the upcoming section.

Section 2: The impact of COVID-19 on the delivery centre (CLV ALGIERS) of Renault ALGERIA and the risk management strategies applied

Measuring and searching into the impact of the pandemic on CLV ALGIERS has presented many challenges since it is sensitive information; the difficulty lies in the access to documentation concerning the phenomena, which created an obstacle in collecting the data needed for the analysis.

Thus, the choice of the analysis tool seemed extremely limited.

1 Methodology of the Study

In order to maximize the use of the available information and answer the main research question, as we recall, "How did the Covid-19 affect the automotive logistic transport, and how did the agile risk management interfere?" We have seen it best fitting to conduct a qualitative study through interviews with the staff of CLV ALGIERS: Logistic team manager, costs responsible, transport responsible, performance responsible, quality responsible, Programming responsible and delivery responsible

First, it is suitable to start with presenting the methodology followed within this research, then a presentation of the results gathered from each response, divided into two. The first part will focus on the consequences of the pandemic on the CLV operations. Then the second part will highlight Renault's risk management process, and finally, a general summary followed by a conclusion.

1.1 Choice of research methodology:

According to the nature of the research, it is convenient to use a Qualitative study that requires intensive analysis, allowing us in the process to gather the necessary information based on answers provided by CLV Renault ALGERIA's team containing their opinions and point of view and some facts related to the Covid-19 era.

This study aims essentially to highlight the consequences of the pandemic on the CLV ALGIERS chain of work and how the managers opted for a risk management methodology facing all risks that appeared; the main goal remains to know the importance of agility of

during that period.

1.2 Tools used to collect information:

There are multiple techniques used within the qualitative study in order to collect the information required for research, amongst which the most used techniques are:

Individual interviews, group interviews, projective, creative, and observation techniques.

Based on the objective set under this research To address this, we used three methods to collect data: the exploitation of internal and external secondary data, in situ observation and carry out an individual interview administered held by relevant stakeholders or the delivery centre of Renault in Alger (See Appendix 01).

This interview technique has three main types: the semi-directive interview, the semi-directive interview and the directive interview.

As the research required versatile information, we opted for semi-directive interviews. Also, as for the limited documentation, we count more on observing the situation during our internship due to the resilience and controlled freedom it offers to the interviewees, thus allowing us to deepen the field of answers.⁴⁴

The questions asked during the interview are intended to gather as much information as possible. We specifically wanted to reach a conclusion containing an accurate estimation of the impact of the health crisis on Renault ALGERIA, specifically on the CLV ALGIERS, therefore the risk management strategies adopted in the face of the pandemic.

Therefore, we will start by analyzing the interviewees' most relevant replies in response to the questions asked.

1.3 Framework of the case study:

Due to the outbreak of the Covid-19, the time's map took new dimensions, and the market environment in which companies are present today split into two eras; the before and the after covid-19.

Moreover, due to these drastic changes, worldwide transportation and distribution operations are getting increasingly complex, lead times are longer, prices are rising, and

⁴⁴ VERNETTE (Éric) ; Techniques d'études de marché ; Vuibert ; 4th Edition ; 2018 ; pp 31,38.

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customer service is not at its best. The escalating risk is threatening SCs and transportation automotive companies' performances worldwide.

To this end, we found it more appropriate to classify our analysis into two parts :

The first will introduce the results of the interviews about the situation or the consequences of the Covid-19 on the delivery centre of ALGIERS, and the second one will summarize the risk management strategies followed during that period.

2. Presentation and analysis of the interview's results (See appendix 01)

2.1 List of the CLV's employees who were interviewed

Table(3;1): Interviewees' presentation:

Name	Job description
OUKALI BILLEL	Head of the logistics flows
MANSOURI MOURAD	Transport responsible
OKBI ATHEMAN	Transport Programming responsible
KHALDI SULLAIMAN	Quality responsible
TALBI BILLAL	System responsible
MORSLI ZAINEB	Cost responsible
MAKHELOUFI WALID	Delivery
ZIAYNI KARIM	Technical team
ALAOUI MOUAD	Performance responsible

SOURCE: elaborated by the students.

The table above represents the list of the Renault staff that we got interviewed during the internship period; every interview session lasted between 30 mn to 40mn.

All the interviewees are working at the delivery centre of ALGIERS.

2.2. The delivery centre Algiers contribution to corporate performance:

"We ensure the transport of our products until the delivery to the final customer." ⁴⁵

CLV's main objective is to ensure that the finished vehicles are transferred to the final client in the best circumstances and with the best quality.

For that to be achieved, an interaction of several teams and employees who work in harmony and in coordination following a list of instructions to realize the objectives set by the responsible; which are mostly the optimization of costs, quality and time:

- Customer satisfaction: the quality of customer relations is always crucial for Renault. As it is a Renault entity, the delivery centre had to put them at the top of their priorities by increasing their satisfaction concerning the vehicle, the services, and treatment.
- Delivery: This stage is crucial for the Renault delivery centre as it represents the last meeting with the customer to evaluate the overall buying experience. In addition, the customer will be significantly influenced as to whether or not they will be satisfied with their dealership.
- Quality: Quality is a significant issue for the entire automotive maker Renault. It is the key to increasing their market and sales.
- Cost and time optimization: the goal of Renault's delivery centre is to optimize cost and time by using optimal management methods; these are objectives set by the general manager in order to achieve desirable margins.

3. The impact of the Covid 19 on the automobile industry, including Renault

"Automotive factories worldwide are affected by problems with the supply of electronic components from their suppliers. The shortage is attributable to the coronavirus epidemic, which has boosted telework-related IT demand at the expense of the auto sector." ⁴⁶

The automotive industry, one of the pillars of the economy, is facing shocks at all levels of its industrial chain. OEMs have suffered considerable losses in fixed costs due to work stoppages. Also, the risk of default by parts companies has increased due to force majeure events, and dealers have had difficulty collecting payments and accessing credit. Due to the

⁴⁵ OUKALI B., Head of logistics flow, supply chain management at Renault ALGERIA.

⁴⁶ TALBI B., System responsible at Renault delivery centre of ALGIERS.

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epidemic, businesses found it challenging to survive in the short term. They struggled to manage their cash flow, supply chains, risks, and strategy in the longer term.

"Covid-19 had a tremendous negative impact on Renault's results and function."⁴⁷

The car manufacturer, which had already announced a drop in sales of 21.3%, was suffering a loss of 8 billion euros in 2020.

It was a new slap for Renault And further proof that the crisis of 2020 has nothing comparable in recent economic history. In February, the diamond-shaped Group announced a loss of 8 billion euros in 2020, for a turnover of 43.5 billion, down 21.7%. Renault had announced a month earlier that its sales had plummeted by 21.3% last year, with less than three million vehicles sold in a car market in free fall.

That was unprecedented. The last colossal loss, following the financial crisis of 2008-2009 - 3.1 billion euros - suddenly seems less dramatic. Furthermore, the blow is all the more complex because it comes after 2019 already in the red (- 141 million euros). Renault had already announced last May a savings plan of 2 billion euros and 15,000 job cuts (including 4,600 in France). This plan has since been extended to 3 billion by 2025.

The most salient consequences are:

- Shortage in terms of components:

Since Renault brings most of the vehicle's components from abroad, the "Algerian components integration rate is 22%", the global health crisis represented a critical challenge for the automotive constructor in ALGERIA.

It was linked to a worldwide containment with the closure of the Romania Dacia "Renault group" assembly factory, one of the leading suppliers of Renault ALGERIA plant, faced a shortage of components and spare parts.

The shortage of semiconductors, electronic components mainly produced in Asia, penalizes the French car industry, and Renault is no exception.

The shortage of spare parts led to decreased production volume, the quality of the vehicles, and the augmentation of transport rates and flows.

Of course, the shortage did affect not only the quantity but also the quality of the vehicles and the lead time:

⁴⁷ ALAOUI M., Performance responsable at Renault delivery centre of ALGIERS.

- Decrease in quantity produced of the vehicles:

According to Renault ALGERIA's data, only 754 vehicles were assembled in 2020 in the country (173 Logan/Symbol 2, 354 Sandero 2 and 227 Clio 4) due to the factory's closure for over a year (from 03/2020) during the health crisis.

The ORAN site, which gradually resumed operations in May 2021, assembled 5,208 cars last year (1,148 Logan, 2,808 Sandero and 1,252 Clio), twelve times less than in 2019 (60,012 units).

Before 2020, 300 vehicles would have been assembled daily, but now it is only 50 vehicles and not every day.

Per year it was almost 70000, and after the outbreak, it is almost 5000.

- Quality and deadline or the delay:

Shortage and non-availability of specific components led Renault to modify certain vehicle characteristics, which resulted in a lack of the desired quality.

Because simply the quality of the spare parts and components directly impacts the quality of the finished vehicles.

"The delay is extended or tripled, impacting industrial and commercial activity."⁴⁸

Lead time is the amount of time taken between an order being placed and an order being received; since there has been a shortage in terms of specific components, the interval of the waiting time was significant during the health crisis, either the waiting for the spare parts or when the client is waiting for his order.

There also is time gain during executions of the tasks, such as when the vehicle arrives at CLV. Before the health crisis, the procedures would continue without any wait to optimize time, but after the Covid-19 outbreak, everything that gets touched by an employee needs to stay for over two hours just to avoid interactions and infections, which led to a loss of time.

- Turnover of the company:

⁴⁸ MAKHELOUFI W., Delivery responsible at Renault delivery centre of ALGEIRS.

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They followed the set objectives for three years, and there were no significant risks. Still, during the pandemic, the contribution was doubled to find ways of improvement to ensure the turnover, if not the reduction of the costs.

- Results:

Before three years, the result reached in the most typical way, but during the pandemic, everything decreased because of several applied instructions.

- Market share:

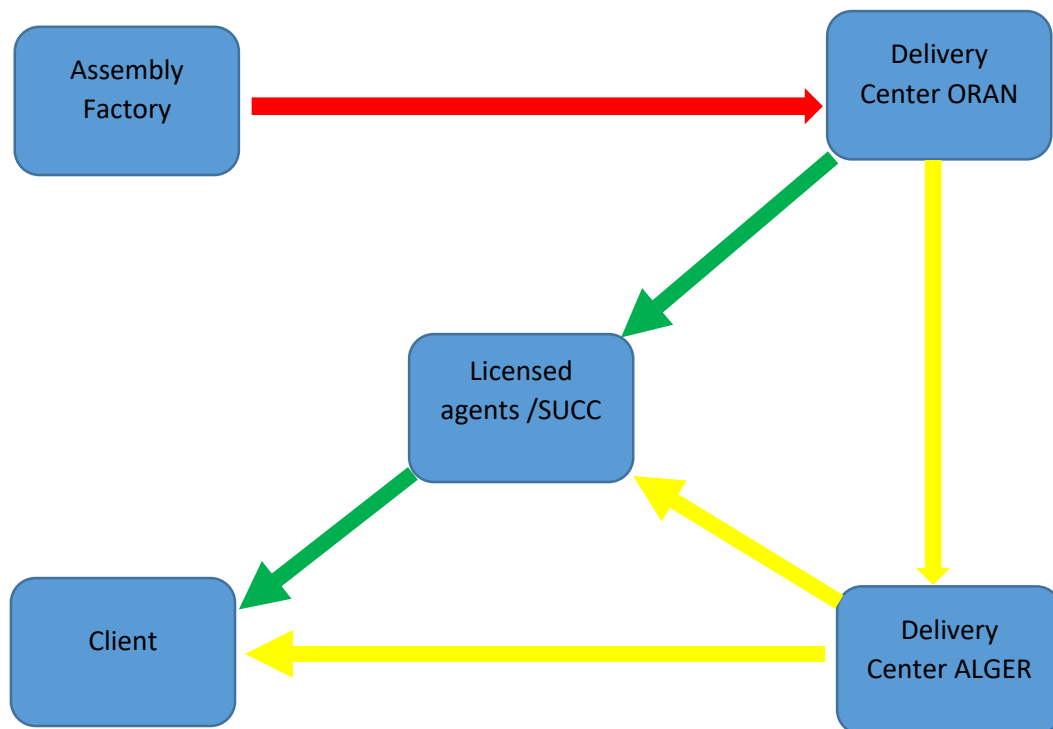
Automatically it has been impacted because the volume has decreased, so the demand has reduced too.

4. Transport flows: programming and the Delivery policy

According to the transport responsible, we can summarize the impact of the health crisis on the transportation flows of the CLV as follows:

Before Covid-19: transportation flows.

Figure(3;2): Transportation floxs before Covif-19



Source: Elaborated by the students

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Physical Flow 01: from the assembly factory to the delivery centre in ORAN (CLE).



Physical Flow 02: from the delivery centre of ORAN (CLE) to the licensed agent or Succ, with a percentage of 90% of the total vehicles assembled.



Physical Flows 03: From the delivery centre of ORAN (CLE) to the delivery centre of ALGIERS (CLV), with 10% of the vehicles to be shipped.

From the delivery centre of ALGIERS to licensed agents or SUCC;

From the delivery centre in some instances to the clients.

- SUCC: is a branch or a permanent establishment that does not have a legal personality but has a certain autonomy of management and direction with the enterprise principal e to which it is financially and commercially attached.

In Renault Algeria's case, there are three branches: OUED SMAR, GRANDS VENTS, and ORAN.

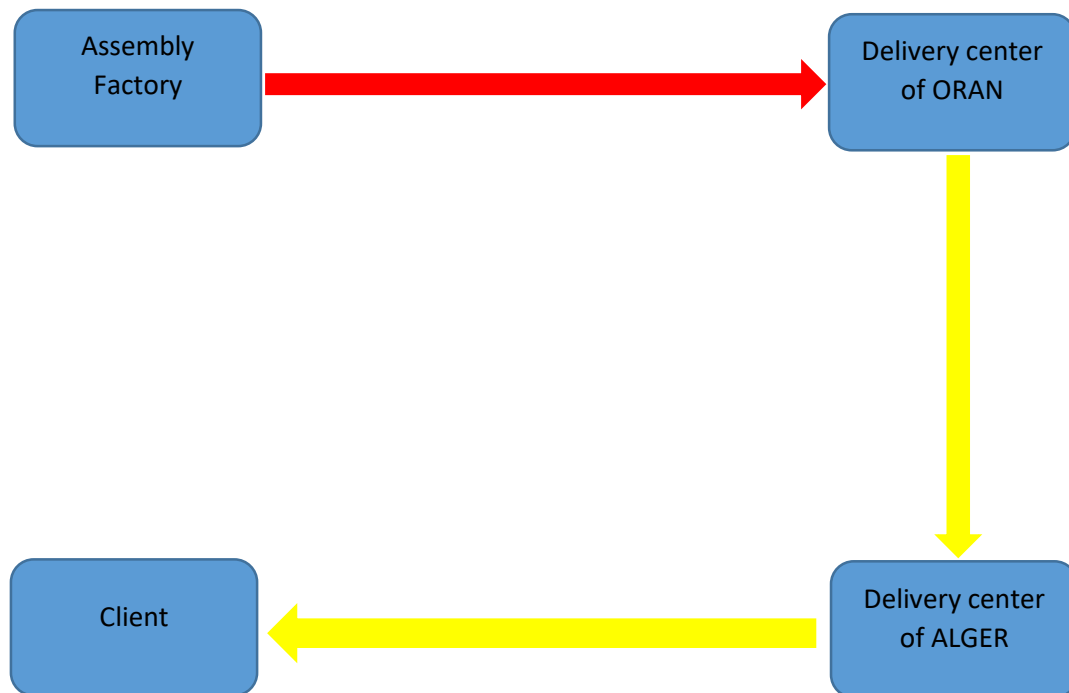
- The licensed agents: The licensed agent is an independent company manager who is not the vehicle's owner but delivers them to his clients.

In Renault ALGERIA's case before covid-19, there was 56 licensed agent; but it gets reduced to only three who are:

SARL HANAN auto; KHERRAF NADHIR ; TACHOCHE.

After Covid-19: Transportation flows

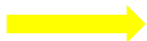
Figure(3;3): Transportation flows after Covid-19



Source: Elaborated by the students



Physical Flow 01: from the assembly factory to the delivery centre in ORAN (CLE).



Physical Flows 02 and 03: From the delivery centre of ORAN (CLE) to the delivery centre of ALGIERS (CLV), then to the client.

➤ The transportation process:

We can quantify the difference also by mentioning the volume of vehicles transferred to CLV before and after Covid-19.

"Before the health crisis, we would programme 80 trucks per day, but we are lucky if we programme 15 in 2 days."

Before the Covid-19 outbreak, the volume of vehicles brought from the CLE ORAN was 22% of the total quantity stored.

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After Covid-19, the volume gets reduced to 10% only, and this is why CLV staff in charge of transport Programming declared that the number of trucks transferring vehicles had decreased dramatically by almost 90%, from 80 trucks per day to 15 trucks every two days.

- In CLV (D_1):
 - Programming batches of 8 vehicles.
 - Attributing batches to the transporters (validation of the vehicles to get transferred).
 - The licensed agent or the dealer must confirm information concerning the trucks and their drivers.
- In the D day:
 - Loading the vehicles in the CLE (Delivery centre of ORAN)
 - Each transporter is responsible for a particular batch, and each batch has its specific code.
 - With a loading permit, the driver checks the vehicles he will transport.
 - Once the batch is declared NTR (nothing to report), the driver starts the loading.
 - Finally, the transporter receives a transfer form.
- The truck's arrival:
 - Unloading and verification.
 - Once the vehicle is NTR, they confirm the reception (storage).
- The delivery phase:

Before: the client used to go to the licensed agents so he could follow the delivery procedures.

After: The CLV do the whole delivery procedure.

The licensed agents receive the client's yellow card, then contact them, and then send the list of the clients to deliver to CLV.

After that, CLV prepares the vehicles (verification, cleaning) and tells the licensed agent that the client's order is ready.

The delivery policy transformed because of the addition of pandemic guidelines for the safety of employees and customers. Also, since the quantity was reduced and to optimize the costs,

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the vehicles do not have to deliver to the licensed agent and then the client; it went straight from the CLE to CLV, and then the client came and acquired his order.

- Cost:

An increase in the transport rates (even the maritime transport rates are eight times higher) because of the quarantine and the closure of the borders from 03/2020 to almost 11/2020 as the first wave hit. In addition to new cost roots, such barrier gestures: as masks, gels, vaccines, specific outfits, and posting of sanitary rules must be respected throughout the CLV (wall posting, ground posting...).

As estimated, we can summarize the expenses and investments increased by 10%.

- Performance:

"They are fixed according to the tasks to ensure the smooth running of the activity."⁴⁹

The first reduction of staff operated a few months ago, has affected 700 employees and 200 contract workers on a total of 1 176 workers.

Note that the 276 employees maintained will be on short-time working, pending a beneficial and final agreement between the plant Renault Production Algeria and the Ministry of Industry for a possible production revival.

In CLE, there were three teams of 8 hours each working all day to reach the volume of 300 vehicle production per day, but after only 1/2 team remaining struggled to reach 50 vehicles per day.

Of course, this affected the CLV because there was also a staff shortage.

As a reminder, the company decided to put its workers on layoff in early 2020 for three months, during which they received 100% of the basic salary the first month, 90% the second and 80% the last month.

According to the head of logistic flows at CLV Algiers, the performance before Covid-19 was 100%, but it got cut in half after the appearance of the health crisis.

In conclusion, the most affected elements in CLV Algiers supply chain or transportation during Covid-19 are time, cost, and quantity, which led to a whole new transport flow and system.

⁴⁹OUKALI B., Head of logistics flow, supply chain management at Renault ALGERIA. ,Op.cit.

5. Renault risk management strategy

Supply chain risk management has become increasingly relevant in the past few years. It is a crucial function of supply chain management, especially during pandemics. The process of risk management has remained the same over time: identify risks, assess them based on their likelihood and impact, and control them to keep them at an acceptable level. Supply chain risks are a severe threat to logistics companies. As a result of the coronavirus crisis, Renault has experienced drastic changes in its daily work. Car manufacturers, port operators and car carriers are seeing drastic changes as well, and it has faced different types of risks such as supply, demand, control, regulation, process, and so on. This has led to new decision-making processes by all parties involved. As part of its risk management program, Renault Algeria has adopted organizational structures and procedures to contain the risks inherent in its activities. These include internal control and risk-management systems implemented in all corporate functions and Regions. Although these structures and procedures cannot guarantee that the company's objectives will be achieved, they help mediate between opportunities and risks by reducing the impact of events on its operations. The risk management system identifies and assesses risks by measuring the level of control over risk factors and management's efficacy in planning for them.

Figure(3;4): Deployment and organization of the internal control and risk management systems:



SOURCE: Renault 2020 Corporate Report

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Renault faces a variety of risks:

- Risks arising from the business environment.
- Transversal risks
- Operational risks
- Financial risks

Renault has developed a hybrid risk management system, combining traditional structures and agile devices. This includes progressive learning, short-term iterations, agile practices, partial deliveries, prioritization, user testimonials, ongoing integrations, and team values. At Renault, the deployment of the risk management system is based on internal control and the anticipated risk management issue. From the beginning of a project, Renault management carries out a risk mapping with all stakeholders to allow them to clearly identify the risks they will face, manage them, and process them to meet their objectives successfully. Renault's risk management strategy is underpinned by:

- a strict risk identification policy based on reporting, monitoring and internal control systems,
- an efficient organization and crisis management tools that make it possible to identify and deal with the emergence of potential risks as quickly as possible.

First of all, Renault Algeria has faced supply risks related to disruptions of upstream sources and inbound supplies. Since March, the company's suppliers in several places, including Romania, France, and Turkey, one after the other, suspended production due to a pandemic that had yet to recover. Because of this suspension's impact on supplier operations and the perspective of ensuring employee safety and security everywhere, Renault Algeria has also been suspending operations by shutting down its factory in Oran due to staff shortages and strict regulations in Algeria and worldwide.

After eight months of a lockdown and suspension of every possible operation, transactions between countries in Algeria were allowed once more, but this time they were under specific structures and some severe conditions; Renault has returned to the battlefield once again. It has returned to work, as instructions were put in place, it was assembling cars according to the available parts as the borders between countries were not open yet, so the factory was trying to solve this problem by discarding specific equipment or removing features in some models to keep production going if possible, If the company could not go through this path, it was

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obliged that the CLV inform its customers that there would be an inevitable delay in their car availability and allow them to decide whether or not to continue with their orders.

Furthermore, the company was concerned about the staff contamination risk resulting from any physical contact; in order to reduce such risk, CLV has created a set of procedures to follow, such as wearing a face-covering in crowded, enclosed spaces, keeping a sanitary distance between oneself and other people, allowing fresh air in if meeting indoors, or meet outside, it also has set up specific areas so drivers could shower and sanitize themselves in the workplace. They also have adopted a policy that vehicles must remain untouched for at least 4 hours since the last time they were touched for every operation.

Moreover, CLV has faced risks of regulations set by the Algerian health ministry, which has disrupted delivering the exact number of vehicles at the exact time to the customers; in another way, they experienced delays in undertaking delivery in the whole country, which was a subject to COVID-19 access restrictions. In response to the situation, CLV did its best to inform clients who may be affected by delays. Furthermore, it has moved to online meetings and digital Request for Information replies for the safety of the community and staff. Finally, Agile boasts a collaborative structure, which naturally leads to greater team transparency and communication. By design, it has a short feedback loop compared to other methodologies.

When teams regroup frequently, they are better equipped to react to the scope and schedule changes and adjust as necessary. Renault Algeria has implemented structures to avoid risks, as at the beginning of the pandemic; CLV has immediately stopped all kinds of operations and kept sharing information between the teams via online meetings (data sharing). Nevertheless, as soon as the government has opened the borders and CLV has returned to work again, they provided all sorts of prevention, yet the staff got contaminated two times, and as a result, the whole CLV needed to stop working for 15 days each time. This was a lack of efficiency concerning the decisions the company has made.

To sum up this analysis, and according to our research, we may point out that Renault ALGERIA has put in place a risk management strategy in all of its operations during the Covid era with a lack of agility (availability of fast reactions, availability of transparency and collaboration between Renault's teams, yet there was an absence of efficiency).

We recommend that it would be better for Renault to adopt an agile risk management strategy.

Research results :

According to the research, we realized we have learned that the impact of the pandemic on Renault's supply chain and transportation was in a graver situation than we had predicted. We can outline the results of our case study in the upcoming points;

- Transportation plays a vital role in the functioning of Renault's supply chain.
- Transportation was the most affected part of Renault's supply chain from covid-19 crises.
- The transport disruption has caused a shortage in terms of components due to the governmental restrictions since Renault Algeria imports 78% of the spare parts and components from the leading suppliers (France, Romania, Turkey).
- The components shortage led to a significant decrease in the assembled quantity in the Oran factory; it also has led to a change in the vehicles quality and an extension in the delivery time.
- Capillary transport Programmation has been reduced from 80 trucks per day to 50 trucks in two days. furthermore, the volume of vehicles brought from the inventory of "the delivery centre of ORAN" has been reduced from 22% before the covid-19 crisis to 10% after the pandemic.
- Transportation flows have been modified, and so is the delivery policy.
- The performance of the delivery centre of Algiers was cut to half (from 100% before the crisis to 50% after that).
- High costs raise (by 10%).
- Renault Algeria has integrated risk management methodology into its system for a long time and boosted this process during covid-19 to limit risks.
- Renault needs to develop its research about risk management to deal with the upcoming uncertainties.

Conclusion of the chapter

Renault's Algeria supply chain was hit hard by the health crisis. It was forced to face multiple disruptions, from the global transportation of the spare parts to the final product delivery

Renault's supply chain risk management strategy was not as effective as it had to be because there was a lack of efficiency concerning the measures implemented to mitigate the risks that had appeared in the covid-19 era.

Recent research has proved that agile risk management was a good act to follow for many companies, and Renault should consider the idea of adopting this methodology.

Conclusion:

Conclusion

The covid-19 health crisis has had a massive impact on the automotive industry, with risks and disruptions affecting the supply chain. In the early stage of the pandemic, the automotive companies experienced a drastic fall in demand for a while to witness a strong recovery that has been steadily increasing during the second half of 2020 and peaked at the end of the first quarter of 2021. Furthermore, they have been experiencing supply disruptions due to the COVID-19 pandemic. There has been a shortage in the supply of critical materials for the manufacturers, and semiconductors are expected to last for at least another two years due to shortages in supply. Goods shipped in containers have been experiencing disruptions by COVID-19 as well. Moreover, to limit the disruptions caused by the health crisis, a SCRM strategy had to be put in place.

Supply chain risk management (SCRM) is a firm's ability to understand and manage its economic, environmental and social risks within the supply chain. This can be manifested through contingency planning and an agile, resilient supply chain.

The silver lining of any crisis is the quick reaction to face the risks that occurred. Covid-19 crisis and its challenges were related to uncertainty, and agile risk management tends to be flexible and adaptive, making it the best approach to face the pandemic as long as this later has been coming in waves, so it is a limited time interval, and the intervention of agility to mitigate the risks was inevitable.

This research paper examines the impact of COVID-19 on the operations of an automotive company in Algeria. The paper focuses on evaluating disruptions and limitations during the pandemic as well as possible risks that can occur. Through this research, we have seen from a different perspective what really happened to Renault's Algeria supply chain, especially transportation, because of COVID-19. In addition, this paper discusses whether implementing a supply chain management strategy can bring the company out of those disruptions.

Regardless of the importance that SCRM has had within entities, the events of 2019, particularly Covid-19, have emphasized the need for further research in this field. Today, companies have learned their lessons the hard way after witnessing unpredictable and quick outbreaks of Covid-19, which collapsed supply chains and crippled economies in no time. All these drastic events worked as an incubator which allowed us to answer our initial

conclusion

research question:" "How does the integration of agile risk management interfere with the impact of the health crisis on automotive logistic transport?"

We chose Renault Algeria as our case study due to its supply chain nature, the complexity of the covid-19 and its adverse impacts on it.

As a result of the analysis of Renault's ALGERIA professional documentation, and thanks to the observation during our internship and the answers to the interviews guideline (see appendix 01), we managed to test the hypotheses put forward at the beginning:

- in the automotive sector, logistics plays an important role at all levels.

The first hypothesis is correct because in the automotive sector logistics plays a major role in all three levels from the acquisition of the components and spear parts from several different suppliers, to the dynamism of the line of production, and finally the dealership and the delivery of cars to the final client.

This later applies to RENAULT ALGERIA as well. starting with bringing the components from three different suppliers Romania France and turkey. moving to assembling those components all along the production line, last but not least the dealership and delivery to the final client according to the company policy. This highlights the logistics cruciality without which no previous operation could have been done.

- Automotive logistics has been hit hard by global restrictions and regulations put in place to cope with the health crisis

The outbreak of the Covid 19 virus severely impacted worldwide transportation, and since Renault ALGERIA is a foreign supplier's primary client, its transportation was also affected. The Algerian government's restrictions on imports from abroad also affected Renault's downstream transport supply chain. Therefore this hypothesis is correct.

- Agil risk management is highly relevant in automotive logistics.

Agile risk management is an essential approach to face such phenomenal crisis such as COVID-19. On the other hand Renault ALGERIA applied SCRM strategies during the pandemic to limit the risks that appeared, yet there was a lack of agility that it needed more

conclusion

efficiency as agile risk management requires. Which has led to several complications during that era. Thus the final hypothesis is correct.

This study tested the formulated hypotheses about supply chain, logistics, assembling operations, and transport disruptions due to the COVID-19 pandemic. The research paper recommended several ways of improving the resilience of the assembling and supply chain operations in the considered company, which were also explored. Through these insights, some valuable information was provided on the impact of COVID-19 on the automotive company.

As complex as the supply chain (SC) may be, it has never been easy to manage. Nevertheless, listing the factors that could endanger it has never been unattainable. The year 2020 proved that this last could be prolonged to involve some new Supply chain risk factors that can generate the occurrence of not only one but all the possible risks within the chain simultaneously. In the end, companies worldwide are now divided into several categories: companies without SCRM strategies facing bankruptcy; companies familiar with SCRM practices but facing a hard time adapting them to the new situation; and finally, resilient companies creating day-to-day scenarios that help them minimize losses. Renault is an example of a company that adapted well to the new situation by creating a strategic plan to decrease the negative impacts, yet there was an apparent absence of agility.

Appendex 01: the interview's questions

Q1: In which structure do you work?

Q2: What are your prerogatives or your job description in CLV?

Q3: Contribution of the CLV to the company's performance?

Q4: What are your thoughts on this global health crisis from a worker in the automotive business perspective?

Q5: Did Covid-19 had a serious impact on the function Renault?

Q6: How containment has affected upstream transportation (if you have information on this)

Q7: what are the consequences of the pandemic on Renault delivery center?

- Job tasks and procedures?
- Work capacity?
- Working-hours ?
- Turnover of the company?
- Results ?
- Market-share ?

Q8: Can you introduce us to some risks appeared because of Covid-19?

Q9: What steps has your facility taken to manage the crisis?

Q10: What measures has the General Management taken to manage the crisis?

Q11: What are the lessons learned from this experience?

Q12: What are your proposals for better crisis manage

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