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DIGITALIZATION OF INFORMATION FLOW MANAGEMENT IN INTERNATIONAL SUPPLY CHAINS OF RETAIL COMPANIES

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Declaration

I declare that this thesis has been composed solely by me and that it has not been submitted, in whole or in part, in a previous application for a degree. The work was made without unauthorized aid. No other than the specified sources and aids were used. Except where states otherwise by reference or acknowledgement, the work presented is entirely my own.

Date & Place

November 18th, 2021, Bremen

Acknowledgment

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Brief Summary

In a technologically changing world, economic operators are organizing themselves and adapting to these changes. The development of trade in the global market makes the supervision of the supply chain more complex. Distributors are often part of an international supply chain that is a series of steps from marketing, product development and design, distribution and delivery to customers. Today, to optimize their international supply chain, many retail companies are integrating the physical process with digital tools: this is digitalization. Indeed, digitalization transforms this long chain into a fully integrated ecosystem that is transparent to all stakeholders. Digitalization is creating a great transformation and requires companies to rethink the way they design their supply chain, in order to implement Industry 4.0 which implies that many processes within the company must be digitalized. This study aims to analyze and evaluate the digitalization in the supply chain of retails companies in Cameroon. To carry out the study the main methodological approach used in this research is the design thinking method in order to understand, explore and materialize the phenomenon of digitalization in the Cameroonian context. The study started with a systematic review of the literature, followed by detailed observation of the functioning of the supply chain of retail companies in general and that of Cameroon in particular and an interview phase in order to identify and clearly define the problems encountered within the companies in Cameroon. During the literature review in this thesis, no literature on supply chain digitalization was found in the Cameroonian context (at least in the databases used), this is due to the fact that it is a new phenomenon in the Cameroonian context. Nevertheless, it helped to design the interview guide for the different interviews, which revealed the main problem related to the poor management of information flows within the supply chain, which has consequences on the whole company, the case study was used and revealed that companies in Cameroon are at the second phase of digitalization which is the use of the Enterprise Resource Planning system. Faced with this situation, different scenarios were developed in order to show step by step the process of digitalization and what each step implies and finally a concept development was elaborated to underline the requirements and the precautions to be taken when digitalizing the supply chain.

Key words*: Digital Supply chain, Retail supply chain, Digitalization in retail, information flow, Management of information flow.*

Resumé

Dans un monde en mutation technologique, les opérateurs économiques s'organisent et s'adaptent à ces évolutions. Le développement des échanges sur le marché mondial rend plus complexe la supervision de la chaîne d'approvisionnement. Les distributeurs font souvent partie d'une chaîne d'approvisionnement internationale constituée d'une série d'étapes allant du marketing, du développement et de la conception de produits, de la distribution jusqu´á la livraison aux clients. Aujourd'hui, pour optimiser leur supply chain internationale, de nombreuses enseignes de distribution intègrent le processus physique aux outils numériques : c'est la digitalisation. En effet, la digitalisation transforme cette longue chaîne en un écosystème totalement intégré et transparent pour toutes les parties prenantes. La numérisation crée une grande transformation et oblige les entreprises à repenser la façon dont elles conçoivent leur chaîne d'approvisionnement, afin de mettre en œuvre l'Industrie 4.0, ce qui implique que de nombreux processus au sein de l'entreprise doivent être numérisés. Cette étude vise à analyser et évaluer la numérisation dans la chaîne d'approvisionnement des entreprises de vente au détail au Cameroun. Pour mener à bien l'étude la principale approche méthodologique utilisée dans cette recherche est la méthode du design thinking afin de comprendre, explorer et matérialiser le phénomène de la numérisation dans le contexte camerounais. L'étude a débuté par une revue systématique de la littérature, suivie d'une observation détaillée du fonctionnement de la chaîne d'approvisionnement des entreprises de distribution en général et celle du Cameroun en particulier et d'une phase d'entretien afin d'identifier et de définir clairement les problèmes rencontrés au sein des entreprises au Cameroun. Lors de la revue de littérature dans cette thèse, aucune littérature sur la digitalisation de la supply chain n'a été trouvée dans le contexte camerounais (du moins dans la base de données utilisées), ceci est dû au fait qu'il s'agit d'un phénomène nouveau dans le contexte camerounais. Néanmoins, elle a permis de concevoir le guide d'entretien pour les différents entretiens, qui a révélé le principal problème lié à la mauvaise gestion des flux d'informations au sein de la chaîne d'approvisionnement, qui a des conséquences sur l'ensemble de l'entreprise, l'étude de cas a été utilisée et a révélé que les entreprises de la grande distribution au Cameroun sont à la deuxième phase de numérisation qui est l'utilisation du système de planification des ressources d'entreprise. Face à cette situation, différents scénarios ont été développés afin de montrer étape par étape le processus de numérisation et ce que chaque étape implique et enfin un développement de concept a été élaboré pour souligner les exigences et les précautions à prendre lors de la numérisation de la chaîne d'approvisionnement.

Mots clés : *Chaîne d'approvisionnement numérique, chaîne d'approvisionnement de détail, numérisation dans le commerce de détail, flux d'informations, gestion du flux d'informations.*

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List of Abbreviations

AI	Artificial intelligence
BD	Big Data
DSC	Digital Supply chain
EDI	Electronic Data Interchange
ERP	Enterprise Resource Planning
RFID	Radio Frequency Identification
GPS	Global Position System
ICT	Information and Communications Technologies
IoT	Internet of Things
OC	Omnichannel
SC	Supply Chain
SCM	Supply Chain Management

Chapter 1: Introduction

1.1 Background

During the World Economic Forum (WEF) in 2017, has been evocated the implementation of industry 4.0. Industry 4.0 means the use of IT in all the processes of companies. Nowadays, IT has taken an important place in life's day company and many companies owe their success to use IT. Industry 4.0 involves that all the processes in the companies must be digitized. Digitalization means the dematerialization and the interconnection increase among the actors. Digital transformation, automation and connectivity will create a high-capacity mobility system that will be flexible to the needs of freight transport. Many companies have been successful thanks to digitalization, whatever their operating sector. For example, in the retail sector, the world's leader Walmart owes his success by using the digital tools to share their information between the actor of the supply chain (Qrunfleh & Tarafdar, 2014). In addition to making business more efficient, the COVID-19 pandemic has clearly demonstrated the value of information technology and digital transformation, as societal and commercial operations have been transferred into the digital space to ensure the continuity of administration, business and the daily life of individuals (Passau, 2020).

The retail sector finds its origin in Europe. Since its creation until today, this sector has experienced a meteoric evolution. Today, the world leader in supermarkets is an American company (Walmart). Europe is fourth in the world. Indeed, the German market of retail is the largest in the European Union (the leader of the mass retail sector in Europe is LIDL which is a German company). According to Euromonitor, this market could represent $ 103.2 million in 2021, or 10.3% growth. Despite this growth in the German market, the world leader in this sector remains Walmart. It owes its success to good management of its supply chain and its suppliers. The good management of the logistics chain of this company is due to the effective management of the information and the ease of its flow between the various actors of this chain (Marois, 2011). Indeed, for good management of its information flow, since 1991 the company has been using a digitized system to manage its information. The name's system is Retail -Link, a computer system that links suppliers to all branches and tracks sales in real-time. Thanks to this system, the company provides all the necessary information to its suppliers.

Furthermore, the company's information system should not only consider the suppliers but all the actors within the supply chain (transport, providers of other services and even the final consumer). In fact, PASSAU goes in the same direction, declaring at a meeting of EU and EFTA transport ministers in October 2020, that in terms of supply chain management, the exchange and sharing of transport data in real-time would reduce costs for operators and make the supply chain more efficient and resilient.

In most African countries in general, retail is still in an embryonic state, accounting for less than 5% of retail trade compared to 60 to 80% in the majority of industrialized countries in the 2000s. The most important are traditional markets as well as small convenience stores and street vendors. This can be explained by the low level of infrastructure development that does not allow mass trade to develop competitively (Bahri-Damon, 2017). However, in African countries, this sector has grown by 6.8% per year between 2002 and 2007 according to a study conducted in 2012 by the consulting firm Performances Management Consulting.

In Cameroon in particular, mass retailers are moving towards stiff competition with the arrival of the Super U brand on the local market at the end of 2017. Cameroon has thus become an essential commercial area and a privileged market. The world number 8 in supermarkets (Appendix 1), Carrefour has opened in Douala and plans to open six shopping centers in Cameroon by 2020, with the opening of an average shopping center in Yaoundé. This points to strong changes in the sector (Brice, 2017). Indeed, the growth rate of the retail sector is estimated at 150% for hypermarkets, 44.56% for supermarket and 5.88% for mini-market (investiraucameroun.com). These numbers were given by the Minister of Trade Magloire Mbarga Atangana.

Thus, there is a proliferation of large and medium-sized surfaces, and also a need to follow and adapt to the evolution of interactions between producers and distributors that have become very important and complex today. This evolution gives rise to fierce competition, an increase in the volume of flows to be managed, and dispersion sources of supply and customers. For this purpose, it is no longer just the management of physical flows, but also the management of information flows and financial flows associated with physical flows. Today, to ensure optimum management of their supply chain, these companies need to synchronize their physical flows with their information flows and financial flows. All of these flows must be managed at the level of the various partners, the customer service, the management of the orders, the after-sales service, and even the final distribution of the products. According to the theory of the decision proposed by March (1960), the information comes to feed the decision-making. The idea is that a good decision is based on the right information. Thus, in the supply chain, information flows

are two-way: from downstream to upstream (placing orders, feedback from consumers, etc.), and from upstream to downstream. These flows make it possible to steer the planning of production, distribution, and after-sales service, with the aim of increasing logistics performance and improving the company's competitiveness. More than ever, the mastery of physical flows requires the mastery of associated information flows, in order to respond to the various complexities of integrated logistics (Fabbe -Costes, Colin 1989). However, the integration of information flows is not the cornerstone of the smooth running of the supply chain. Indeed, there is a large volume of information to manage and to exchange with the main partners. This information includes demand forecasts, inventories, customer information, business information, market and competitor information, product and service requirements, etc. (Nowicka, 2019). For this purpose, Liker et *al*., 2004 assert *" ... sharing a lot of information with everyone helps to ensure that no one will have the right information at the right time ...* ". This implies that the supply chain requires the availability of timely, accurate, and relevant information that is essential for effective decision-making.

Thus, all this information can not be coordinated without digital support that promotes exchange between the main actors in the logistics chain. In addition, digital tools allow the supply chain actors to have: sales information, better communication with sales networks, and good demand management through the reduction of risks. The importance and necessity of digitized information in the logistics chain have led us to focus on the digitalization of information flows in the supply chain of retail companies.

1.2 Problematic and Research Question

Information sharing within the supply chain has become an important subject over the past decade (Huo et *al.*, 2014). Information sharing is viewed as the fundamental capability in managing the information flow in the supply chain process (Shore and Venkatachalam, 2003). It provides significant productivity gains from the information flow (Barua and Lee, 1997). Sharing information effective goes through the use of Information Technologies (Wu et *al.*, 2006). Information Technologies provide real-time information sharing in order to minimize cost and to improve the service's quality. Information sharing is recognized as one of the keys to efficient supply chain management (Ganesh et *al*, 2014).

However, one of the important phenomena at the origin of many dysfunctions in the supply chain according to many authors (Baganha and Cohen, 1998; Bourland et *al*., 1996; Lee et *al*., 1997; Chen, 1998; Chen et *al.*, 2000; Christopher, 1998; Gavirneni et *al*., 1998; Lee et *al*., 2000; Lee, 2002; Zeng and Pathak, 2003) is known as a bullwhip effect (the amplification of demand fluctuation downstream upstream of a supply chain). This phenomenon is mainly related to the lack of information sharing, which has an impact on the products in the points of sale and the products stored in the large warehouses of the distribution centers.

To cope with the consequences of the bullwhip effect, it is necessary to maintain more transparent information between the various actors in the supply chain, so that links in the upper position of the chain have access to the information of the suppliers, points of sale, and therefore, a knowledge of the actual demand. For this, Workflow systems are designed to facilitate the organization of work, by putting on the same technical platform the technical data of operation, control (Enterprise Resource Planning), processes of information transfer by the use of Electronic Data Interchange (EDI) and New Information and Communication Technologies (Lee et al., 2000). The use of these tools and technologies is done only when the information has been digitized. This is why companies need to focus on digitizing their information in order to facilitate their flow within the supply chain. Thus, thanks to the digitalization, the information is more reliable (fewer errors contrary to the manual management of the information) and transparent. According to Jammernegg (2015), digitalization allows companies to achieve a higher level of stock aggregation, which would allow for a significant reduction in stock levels. He goes further by offering 3D printing that he believes will help reduce storage and transportation costs.

Despite the many solutions proposed by researchers and specialists in the management of information flows throughout the supply chain, it has been noted that multiple failures related to the management of information flow persist in the points of sale in Cameroon. In fact, it has been seen very often out of stocks in the store and also overstocks which results in the expiry of the products. This situation causes sales points to launch promotions within a few days of the expiry date of these products. As an illustration, during the interviews conducted with managers of self-service stores in Cameroon, a manager states: "... *we sometimes face stock-outs for some popular products, overstocks for others, delivery delays ... noncompliant deliveries or billing errors are some of the concerns we have with suppliers …*". He continues his remarks by saying: "... *these situations cause us a lot of problems, which is why you can not find the same products regularly on the shelves and also... You see that some of our products are often on sale a few days before their expiration ...*". All these problems stem from logistical

dysfunctions, or poor coordination of information flows among the various actors in the supply chain. In addition, good coordination of information flows requires the digitalization of information (Jammernegg, 2015; Hanifan, 2014 and Morabito 2014) and the establishment of appropriate mechanisms (digitized mechanisms) (Toyasaki, 2013; Almotairi, 2011, Bayraktar et *al*., 2009, Thomas, 2004; Johnson and Whang, 2002; Cassivi, 2004).

In addition to these problems, the health crisis due to Covid-19 has led Cameroonian retail companies to realize the limits of their non-digitized system. During this period of crisis, the operations of these companies have been reduced because the majority of activities are carried out manually which requires the presence of employees on the spot, as the respect of the measures is obligatory, the employees could not all be at the same time, the manual activities are then reduced by half. During this period the most observed problems were a high rate of product wastage where the manual wastage dates were not checked in time by the employees due to the reduction in staff; there were also consequent stock shortages for high turnover products because there was no system to synchronize sales and stock levels which could trigger the automatic ordering procedure to suppliers. In addition, these firms also had to contend with the fact that most of their employees had no control over the use of existing digital tools since before the crisis they were used to working manually.

These malfunctions are the consequences of a phenomenon bullwhip effect with origin lack of sharing of information within the supply chain and the poor coordination of information flows among the various actors in the supply chain.

However, when talking about these same companies in the European context, is referring to supply chain 4.0, where the supply chain is no longer limited to buying, manufacturing, moving or selling the right items, in the right quantities and the right places (Wu et *al.*, 2016), it is another dimension where talking about the supply chain in terms of innovation and technology.

These new digital technologies have profoundly changed the way societies exchange information and interact with each other between them (Büyüközkan and Göçer, 2018; Nasiri et *al*., 2020).

The point is how the same companies can have big differences in the management of information flow in their supply chain.

Due to that, the analysis of the research works and the findings made in the management of the supply chain of retail companies located in Cameroon lead us to question the management mechanisms put in place in these companies to control their information flows. In other words, the purpose of this study is to identify, analyze, and understand the digitized information flow

management mechanisms put in place by retail companies, explained by those implemented in Cameroon. From this issue arises the following main research question:

How is the retail supply chain implemented in Cameroon affected by the digitalization and how to improve this supply chain by using digitalization?

In order to answer this question, other research questions need to be considered, as outlined below:

- What are the digitized management tools put in place by retail companies located in Cameroon to manage their information flows in their international supply chain?
- Are these management mechanisms appropriate to the Cameroonians context?
- How effective are these digitized mechanisms?

These are the questions to be answered in this thesis.

To answer the research question, four (4) objectives have to be considered:

- Identify the various digitized tools of management of information flows deployed in the retail sector in Cameroon;
- Analyze their adequacy with the specificity of the Cameroonian environment;
- Examine their effectiveness;
- Identify and describe the difficulties encountered by using these digitized management mechanisms in the management of information flows.

1.3 Relevance of Topic

This research work has a double interest:

On the theoretical level: While it is true that so far there has been a lot of research and numerous publications on the digitalization of information flow in general, it must be recognized that most of these studies have been done in different countries technologically advanced and where logistics research is very advanced. By focusing on digitized information flow management system in Cameroon, a technologically less advanced country in search of emergency, the study will contribute to the enrichment of existing works and could open other avenues of logistics research in emerging countries where documentation is poor and scarce.

On the managerial level: In a context of exacerbated competition with the entry into force of the Economic Partnership Agreements (EPAs), companies located in Cameroon are more than ever concerned about their performance and their competitiveness. A study of the importance of digitized information flow management system in the supply chain may, therefore, be beneficial in that it will enable supply chain partners to better understand the tools that can be used to manage their information flow, to invest more in the acquisition of modern management tools to improve the performance of their business.

Chapter 2 Methodological Approach

The main methodological approach used in this research is the design thinking method in order to understand, explore and materialize the phenomenon of digitalization in the Cameroonian context, then a research design was elaborated in order to highlight the overall strategy used to carry out the research. This involved defining a succinct and logical plan to address the research question and finally, the conceptual framework was developed to organize the ideas to understand the phenomenon of digitalization.

2.1 Description of the Design Thinking Method

Design thinking is described as a solution-, action- and needs-oriented method and is associated with creative action, technological feasibility, alternative solutions, emotional satisfaction and future results (Barsalou, 2017). The design thinking can be divided in several phases. However, in this research is divided into three successive phases. This process starts with the understanding phase, then the exploration phase and finally the materialization phase. This method is illustrated in Figure 1.

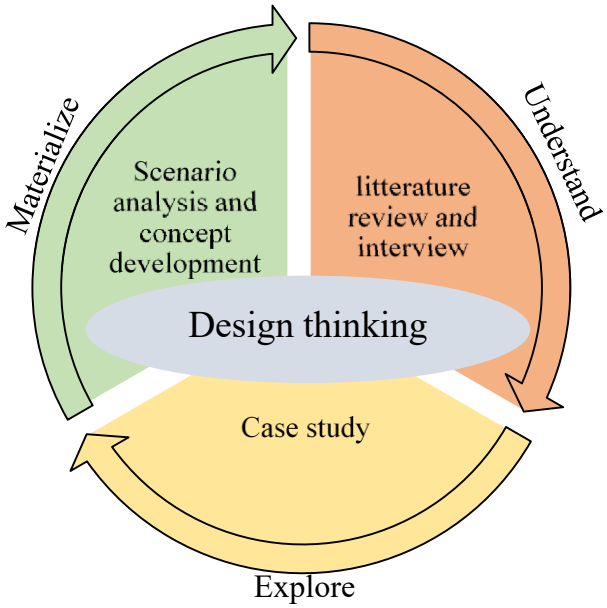


Figure 1: Structure of the Design thinking process
(Source: Author´s own elaboration)

2.1.1 Understanding Phase

The understanding part can be summarized in two stages: the problem identification and the problem definition. To carry out this phase the following tools were used: the literature review to better understand the phenomenon of digitalization in order to identify the gaps in the existing works and then the second one is an expert interview to concretely define the existing problem.

2.1.1.1 Literature Review

An analysis of the existing literature was carried out throughout the research. The phenomena of digitalization and supply chain management in general and that of retail companies, in particular, have been reviewed over the past 5 years. The literature on these two concepts has been analyzed. This analysis focuses on the relation between the digitalization of information flows and the efficiency of the supply chain of retail companies.

Indeed, digitalization has begun to receive a lot of attention from practitioners around the world, as it creates competitive advantages for companies that have successfully implemented it. Digitalization is a new phenomenon that is evolving and developing exponentially, meaning that older literature may be outdated. The documentation reviewed was classified into different subgroups. These different subgroups were chosen according to the pillars of digitalization defined by Hanifan (2014) and Morabito (2014) and other themes such as the digital supply chain, digitalization in retail...

The literature employed consists of the paper related to retailing, digitalization, supply chain, logistics. For that, the database Business source premiere was used to identify recent work, by using the combination of keywords digitalization* supply chain* retail companies. The Emeralinsight and Elsevier databases are used. Google Scholar searches were also used since it is a search for scientific articles and reports.

Table 1: Summary of the papers selection method

Items	Description
Period of analysis	2015-2020
Keywords used in the research	Digital Supply chain, Retail supply chain Digitalization in retail Big data (BD) and Supply chain management Cloud manufacturing and Supply chain management, Internet of things (IoT) and Supply chain management, Blockchain and Supply chain management, Augmented reality (AR) and Supply chain management, 3DP (Additive manufacturing) and Supply chain management
Document types	Journal Articles and Conferences papers
Sources	Scopus, Emeralinsight, Elsevier databases, Google Scholar

Applying these selection criteria, 158 papers have been identified between 2015 and 2020. The choice of the period can be justified by the fact that before 2015 the number of articles published in the field of digitalization varies between 1 and 4 (Zekhnini et *al*., 2020), it is from 2015 onwards that there has been a real growth in publication, reaching 60 articles in 2019. This can be explained by the fact that researchers and companies have become aware of the importance of digitalization of their supply chain and companies are increasingly oriented towards digitalization.

Some special aspect related to the literature review are as follow:

1) Geographical locations of the authors

These published researches are distributed in figure 2 according to the geographical location of the authors.

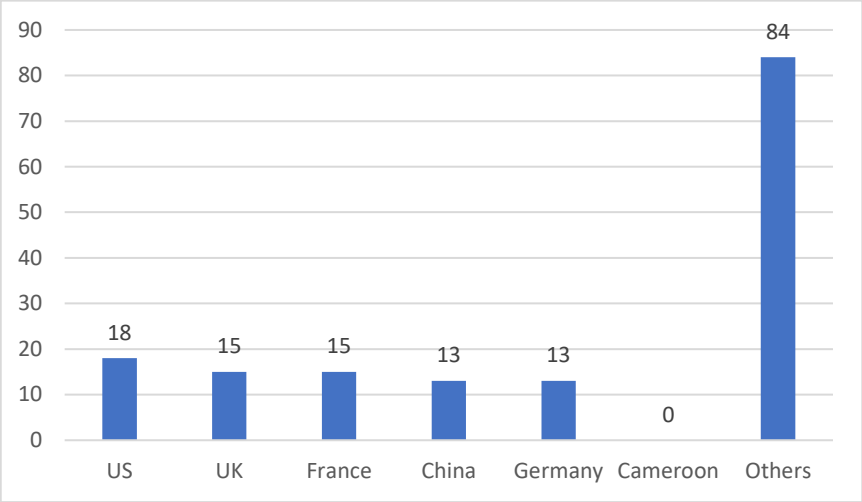


Figure 2: Number of papers by country
(Source: Author´s own elaboration)

The major research on Digitalization of the supply chain is being carried out in the USA (18), followed by UK (15), France (15), China (13) and Germany (13). It can also be observed that no articles have been published in Cameroon, or at least none have been identified in the used databases.The "others" category is devoted to countries (35) with less than 10 published articles between 2015 and 2020.

These results tell us that almost all publications are made in developed countries and that there is little interest from underdeveloped countries. These results could be explained by the fact that developed countries are technologically advanced, that they are familiar with these new technologies and that it is easier to test hypotheses, to observe practices, to make experiments... in contrast to underdeveloped countries, which barely hear about these new technologies.

2) Distribution by journals

The selected 158 articles on digitalization of supply chain were published across many journals. The figure 3 only reports journals having published at least three papers in the concerned field.

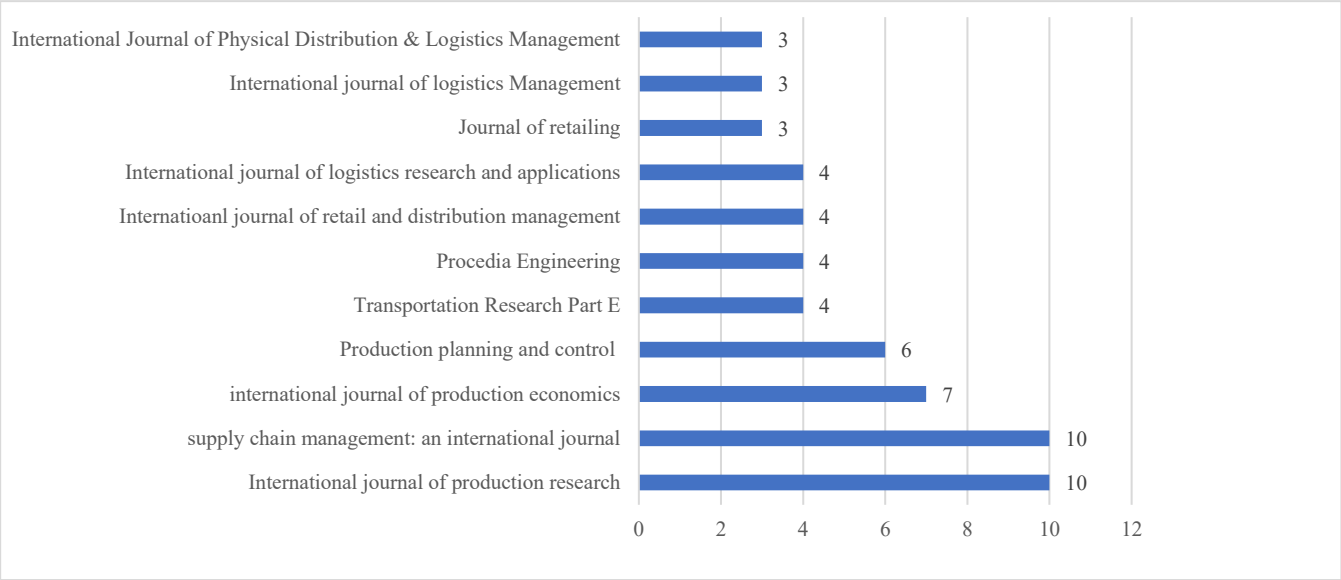


Figure 3: Journals distribution
(Source: Author´s own elaboration)

It appears from this diagram that the journals that have published the most research in the field of supply chain digitalization are the Supply Chain Management: An International Journal and the International Journal of Production Research with 10 publications each in the period delimited in this research (2015-2020).

3) Summary of the literature of digitalization of information in the supply chain.

The literature reviewed in the field of digitalization of information flows along the supply chain of the retail sector presents the current trends of digitalization (predictive analysis, omnichannel, mass customization, phygital.), the success factors of this digitalization (technologies, environment, infrastructure...) and also the efficiency of a digitised supply chain (reactivity, improvement of the service level, traceability, agility, delivery precision, flexibility...). Below, the summary of the literature employed has been presented according to each element. The development of digital technologies allowed the international supply chain to be more flexible and efficient (Khajavi and Holmstrom, 2015). Many researchers have addressed the integration of digital tools throughout the supply chain especially in the field of food products which would allow good traceability of the supply chain and ensure the integrity of food products. According to Khajavi and Holmstrom (2015), the development of digital technologies and the availability of mega databases have made the international supply chain more effective and efficient. With many digital platforms, operations throughout the supply chain have become less costly and

take less time to execute. With these tools, the information exchanged in relation to the products ensures traceability, safety, and quality of the products. PricesWaterhouseCoopers offers several digital technologies that have transformed the traditional supply chain into a digital supply chain including Big Data, IoT, Robot, 3D printing, blockchain, drones (Eckert, et al., 2016).

These technologies allow the company to be more flexible and closer to the end consumer. In the case of certain products, the consumer can go as far as to design his own product according to the characteristics he wants. This is the case, for example, with 3D printing, where the consumer becomes a co-producer of the product he buys. Moreover, the availability of information in real-time allows the company to anticipate demand and also to foresee possible changes in consumer behavior in order to personalize the offer. The digitalization of the supply chain in the retail sector has favored several trends in the company such as demand prediction, digitalization of the point of sale, personalization of the offer made to customers.

The transformation of the supply chain into a digital supply chain allows for effective management of the last mile, ensuring product traceability through the implementation of Blockchain technology, which reduces the complexity of the chain by providing transparency of all operations and activities, traceability and real-time information availability to all stakeholders (Lewis 2017; Wehberg et al., 2017). In addition, some researchers have worked on the success factors of supply chain digitalization because it is not enough just to implement it, certain factors must be put in place for its effective use (Büyüközkan and Göçer, 2018; Kersten W. et *al*., 2017). Indeed, the digital transformation is more than a simple implementation and use of digital technology, it is a strategic decision that engages the future of the company in the long term and therefore requires resources, skills, and time and above all put in place the digital culture for its success.

The table 2 summarizes the literature used by presenting the elements studied and how these elements have transformed the supply chain in the retail sector.

Table 2: Summary of the literature

Element	Transformation	Literature
Digital supply chain	Last mile deliveries, Digital tracking of product, Information sharing at all stage of supply chain,	Hübner et *al.,* (2016), Kumar et *al*., (2016) ; Wu et *al*., (2016) ; Scuotto et *al*., (2017) Lewis (2017) ; Wehberg et *al*., (2017) ; Tjahjono et *al*., (2017) ; Rodriguez Molano et al., (2017)
News trends in retail	Trade prediction	Kopp (2013); Hagberg et *al.*, (2016) ; Hänninen et *al*., (2018) ; Wang Y. et *al., (*2018) ; Raman et *al*., (2018);
	Mass customization	Tseng and Piller, (2003); Lipson and Kurman (2013); Wehberg et *al*., (2017); Savastano et *al.,* (2018).
	Omnichannel	Hüseyinoğlu et *al.,* (2017), Saghiri et al., (2017); Galipoglu et *al.,* (2018) ;
	Phygital	Shankar (2011); Bala (2012); Hagberg et al., (2016), Keckhut et al., (2016) ; Bathelot (2018), Raman et *al.*, (2018).
	Blockchain	Casado-vara et *al.,* (2018) ; Kamble et *al.,* (2018 a et b) ; Sander et *al.,* (2018), Treiblmaier (2018) ; Hald and Kinra (2019), Wang et *al.*, (2019 a et b) ; Min (2019), Queiroz et *al.*, (2019).
Success factors	Physical infrastructure Culture test & learn Collaboration Competences	CapGemini (2016) ; Koonce (2017) ; Lewis (2017) ; Wehberg et *al*., (2017) ; Gharehgozli et *al*., (2017) ; Kersten W. et *al.,* (2017) ; Büyüközkan and Göçer, (2018) ; McKinsey (2018).
Efficiency	Real time supply chain Achievement of cost reduction targets Recording failures in the process Capacity to respond to hazards Improvement of supply chain performance Increase of employee performance	Piramuthu (2005) ; Raisinghani and Meade (2005) ; Halley et *al.*, (2006) ; Sahay and Ranjan (2008); Moreira (2011); Bala (2012); Seo et *al.,* (2014) ; Glas and Kleemann (2016) ; Wu et *al.,* (2016) ; Rodriguez Molano et *al.,* (2017) ; Howell (2017); Rajnai and Kocsis (2017); Wehberg et *al.,* (2017); Lewis (2017); Chavez et al. (2017) ; Tsang et *al.,*(2018) ; Tortorella et *al*., (2019); Kamble et *al*., (2019)

4) Literature Gap

The literature examined deals with the phenomenon of digitalization in technologically developed countries. The phenomenon is studied in the context of highly advanced technology. However, the reality of the context of this study is quite different. This context is characterized by underdevelopment, where technology and infrastructure are almost non-existent. No study in the used databases has been done in the Cameroonian context on the digitalization of information flow in the supply chain. The solutions proposed by the studies in the developed countries could not be generalized to Cameroon.

To overcome this lack of literature, this study focuses on retailers in Cameroon in order to explore the concept of digitalization, its practice, challenges, and opportunities that can promote its implementation throughout the supply chain.

For this reason, this study will be based on the solutions proposed by existing studies and make recommendations appropriate to the Cameroonian context in order to increase digitalization and benefit from its effectiveness in the supply chain of retail companies. This supposes that technological, infrastructural, environmental, and human requirements should be considered.

2.1.1.2 Expert Interviews

Based on the results of the literature review, and the research objectives, interview guidelines were developed. The interviews will be conducted mainly on retail companies and more precisely foreign companies implemented in Cameroon and some national companies. Intervenors will be employees of the various departments in order to get an idea of how each department operates throughout the supply chain. The objective is to conduct interviews with at least one manager from each of the following departments: supply chain, supply, and sales, department manager, cashiers... The reason for the choice of these people is that they are directly concerned by the changes related to digitalization that can occur within a company and they are holders of information on changes in consumer behavior, customer complaints, and the degree of their satisfaction in order to assess the effectiveness of digitalization.

The purpose of the interviews will be to obtain information on the effectiveness of supply chain digitalization within the retail sector. On the one hand, the topics addressed were related to the current trends of these companies in terms of digitalization, as well as the challenges that result from digitalization within the company. And secondly, the guidelines focused on assessing the

effectiveness of these digital tools in the supply chain and finally knowing the future prospects for digitalization within these companies. The interviews were carried out in the different selected companies (six). It was conducted by addressing the following topics.

- The different stages of the supply process at the level of national suppliers and also at the level of international suppliers;
- The different negotiations made throughout the supply chain;
- The information exchange system along the supply chain;
- The digital technology used within the supply chain;
- The future perspective in relation to digitalization.

However, the health crisis due to the COVID-19 pandemic has profoundly changed the course of the interviews within these companies. Faced with this situation, only two companies out of the six were willing to welcome the face to face interview, the rest of these companies reduced their access as much as possible, so they offered to do the interview by phone, email, or Skype.

This interview guide (Appendix 2) was first emailed to these companies to give them an idea of the looking information for and to put us in touch with the people who could answer us correctly and clearly. After the interview guide was sent out, telephone appointments were made for some of them and skype appointments for others. On the day of the appointment, the phone calls or video calls via skype were made. During these calls, the interlocutors have been warned that their answers would be noted and they asked us to guarantee that they would remain anonymous regarding the name of the company and the name of the respondent, which is why in the table (Table 9) describing the sample of this study only the position of the respondent was mentioned. Thus, it was possible to ask the questions that were in the interview guide and note the answers.

For some companies, the questions were asked in order, while for others the order was not followed since during the conversation some people answered certain questions without even having asked them. For some companies, after the first phone call, while verifying the data collected, it has been noted some misunderstandings. Faced with this situation, new phone calls have been made because, during the first phone call, the respondents told us to call back if there are any misunderstandings in relation to their answer or for additional information, indicating a time slot in which they could reply to us, out of the four companies that had made

telephone appointments and skype, after the first call, a second phone call has been made to two companies for more information.

2.1.2 Case Study as an Explore Method

The exploration part was carried out thanks to a case study made within the various companies established in Cameroon in order to build a real representation of the situation of these companies.

The case study is, according to Bonoma (1985), "a description obtained directly from a managerial situation, from interviews, archives, observations or any other source of information, constructed to account for the situational context in which the behavior takes place". According to some authors, this type of study is described as an exploratory study, following the example of Rispal, (2000). It involves an in-depth and intensive study of one or more situations in one or more enterprises. In the case study, the researcher has to place himself in an inductive research logic where he focuses on the concrete problems encountered in the functioning of a company, its actors, its partners. In this research, the case study methodology is chosen for the following reasons:

- Firstly, this research aims to understand the mechanisms of information flow management existing within companies in the retail sector. It is about knowing how digital tools work. Consequently, the survey and analysis of archives do not correspond to the objective of the research as they cannot provide the details necessary to understand how these tools work;
- Secondly, this research aims to provide a better understanding of the supply chain of retail companies in the digital age. Thus, this research focuses on new and contemporary phenomena and therefore useful data can only be obtained through an in-depth study of the phenomenon within the organization.

This research adopts two approaches in the processing of the information obtained.

The first approach concerns the individual cases, which involves describing each case in full detail based on the observations and information obtained during visits and interviews within these companies.

The second approach consists in making a comparison between the companies observed by dividing them into two groups: on the one hand, national companies and on the other hand,

international companies implemented in Cameroon. This comparison would be made on the basis of the elements studied within these companies.

2.1.2.1 Justification of the Number of Cases

In order to ensure the degree of confidence in the results obtained, and to limit or control the specificities due to the selection of a particular case, some authors (Eisenhardt, 1989, 1991; Yin, 1994) suggest using several case studies and not just one case in order to vary the contextual characteristics of a research project. To this end, Eisenhardt (1989) notes that, below four cases, it is often difficult to generate theory and its empirical field is likely to be unconvincing unless each case has mini-cases within it. Moreover, this limit (less than 4 cases of enterprises) is questioned by Yin (1994) who proposes, for exploratory studies within a logic of discovery, to compare two to three cases. The importance of the intended research objective can be seen here. The choice of a single case can be justified by its revealing character: the choice of two or three cases can be legitimate by the exploratory nature of the research; the choice of four to ten cases can be motivated by a desire to compare and generalize the results. To this end, Eisenhardt (1989) subscribes to his point of view in the logic that most research of this type includes a number between four and ten cases. Thus, this research aims to conduct multiple case studies rather than a single case study, as multiple case studies can help to avoid researcher bias (Voss 2009), and multiple cases increase the external validity by which a single case study limits the generalizability of research results (Voss, et *al*., 2002). To this end, this study will focus on 6 cases of retail companies in order to achieve generalizable results.

2.1.2.2 Case Selection Method

In a case study, the sampling method is important for the validity of the research results. In this study, the cases are first chosen according to the sector of activity, as this research concerns companies in the retail sector. The enterprises concerned are of two types: on the one hand, national enterprises (typically Cameroonian) and on the other hand, multinationals with a representation in Cameroon. The choice of Cameroon as a field of study because Cameroon has become an unavoidable commercial field and a privileged market because is increasingly observed the arrival of the world giants retail. Moreover, companies are chosen according to their dominant position in the commercial environment, whether at the national or international level.

In addition, the different types of products marketed by these companies demonstrate the importance of digital throughout the supply chain. Finally, the size of the point of sale in the selected case shows the efficiency of the digital tools used.

2.1.2.3 Collection Area of Different Cases

This study consists in knowing the different processes of product supply in order to identify the different digital tools used throughout the process until the final consumer purchases the product. To this end, the process began by observing the points of sale, focusing on the presence of the products on the shelves of the points of sale, their regularity, their condition, up to the moment of purchase of these products by the consumer. As a result, several visits have been made to many points of sale in the cities of Yaoundé and Douala because it is in these two big cities that the retail sector is the most developed. Indeed, these two big cities are the gateway to all the companies in the retail sector. All companies in the retail sector that are starting up, be it national or international, are starting to establish themselves in Yaoundé and Douala before expanding into other cities in Cameroon. Once the different companies have been observed, the choice of the cases has been done according to the size of the company and the coverage of the market (number of points of sale) as far as national companies are concerned.

2.1.2.4 Difficulties Encountered During the Study

During the visit to these companies to carry out the interviews, many difficulties have been encountered, the most important of which were the following:

Difficulty related to the accessibility of respondents: the company is a professional environment where employees are busy with their work. Despite our willingness to stay within the company and carry out the research in person and by living the daily lives of the employees, the health situation linked to the new Corona Virus pandemic did not allow us to conduct all of the interviews face to face with the respondents and to live their daily lives and interviews have been done in almost all cases by telephone and email.

Difficulties related to the cost of the interview: due to the multiple phone calls and skype calls and their duration, enormous costs have been bearing, in addition, enormous costs result to this, the stay for research in the cities of Yaoundé and Douala has been extended because of the postponement of the visit of two companies to be interviewed, this is because of the lockdown

period in Cameroon due to the pandemic, for this reason, the visits to these companies have been postponed to a later date. this situation has resulted in additional costs due to the extension of the stay until the situation improves.

Difficulty in obtaining appointments: it was very difficult to obtain appointments in the companies studied. Indeed, the request for a research stay within the company was made by email. The first difficulty was that of obtaining the correct email address to which the company responded because, on the home page, the majority of these companies did not mention the email address where they could be reached, and even if the address existed, the emails sent never received a response. To face this difficulty, contacts have been established with the known person in Cameroon to have them come down to the company and ask how to contact the company's senior managers by email, that's when the right email has been obtained. Moreover, having these email addresses in person at the company level was not an easy thing to do because the secretaries were not at all pleasant, which made the task a little more difficult.

Difficulty to get answers: to get answers to the request emails, several emails have been sent many times to these companies, thus it is after insisting that answers have been got.

2.1.3 Materialization Phase

Materialization is the last phase of the design thinking method. This phase consists of a test step and that of the implementation. This phase was carried out thanks to the analysis of the various scenarios in order to test its feasibility and to a proposal of a concept development which proposes the various elements to be set up so that the implementation of the digitalization within the supply chain in the Cameroonian context is successful.

2.1.3.1 Scenario Analysis

Scenario analysis consists of analysing the impact of possible future events on the company's performance, considering several alternative outcomes (Balaman, 2019). Indeed, different scenarios are presented with different options for future development paths, which leads to variable results, i.e. each scenario will have a result and corresponding implications.

Scenario analysis can be used to explore changes in system performance in a theoretical scenario in order to propose practical solutions based on these theoretical findings.

In this research, the scenarios are elaborated by considering the digitalization of the links of the retail supply chain companies. Thus, for each link in the supply chain, a digitalization scenario will be proposed in order to see what impact it will have on the other links and on the overall performance of the supply chain. This analysis will stop only when the ideal scenario is found in order to propose a concept development and its implementation.

2.1.3.2 Concept Development

Concept development is the process of developing ideas to solve a specific problem. After the generation and selection of ideas, the concept development is the detailed version of the idea (MBA Skool Team, 2016; Collins et *al.*, 2015). Thus, when a company wants to implement a new concept, it should go through several processes. To this end, the concept development of the digitalization of the retail supply chain companies in Cameroon should consider a number of elements: the company's objectives, the customers' expectations, the requirements in terms of technology or physical infrastructure, the company's opportunities, the challenges and the precautions to be taken during its implementation.

The elaboration of the concept development of digitalization in this research will consider all these elements in order to give a practical and concrete approach to the implementation of digitalization within the retails supply chain.

2.2 Overall Process of Research

This research is part of an inductive approach since digitalization is a new phenomenon in the context of the study. Existing theories and observed models are combined to reach conclusions and find effective solutions to the problem. In addition, in this research an exploratory study was conducted to define the problem since the phenomenon studied is new and therefore not clearly defined (Wolfgang et *al*., 2009).

This study is part of a qualitative approach, more specifically in a case study perspective. Indeed, the case method makes it possible to study in depth a phenomenon or a practice (Gagnon, 2011). In addition, the methodological approach is guided by the desire to describe and understand the digitized mechanisms of information flow management in retail companies because

the field of logistics in general and that of the management of the information flow, in particular, is of interest to many researchers today. Also, the analysis of many theoretical and empirical work that has been done in the field of logistics in general and the management of information flows in particular, in order to understand the importance of the use of these mechanisms to evaluate the effectiveness of those used by companies implemented in Cameroon.

The literature review was the basis of this study. From the documentary analysis and exploratory study, it was possible to refine the research problem and formulate the research question to which answers are given throughout the essay and also to design the guidelines for the interviews. The data gathered from the interviews and literature review allowed analyze the problem in-depth and propose solutions and recommendations. Furthermore, the study is based on the research design proposed by Hevner et al. 2004. However, some modifications have been made to his design in order to adapt it to this study. Instead of demonstrating, this study seeks to assess the current situation in the supply chain with regard to digitalization in order to propose solutions to what is wrong.

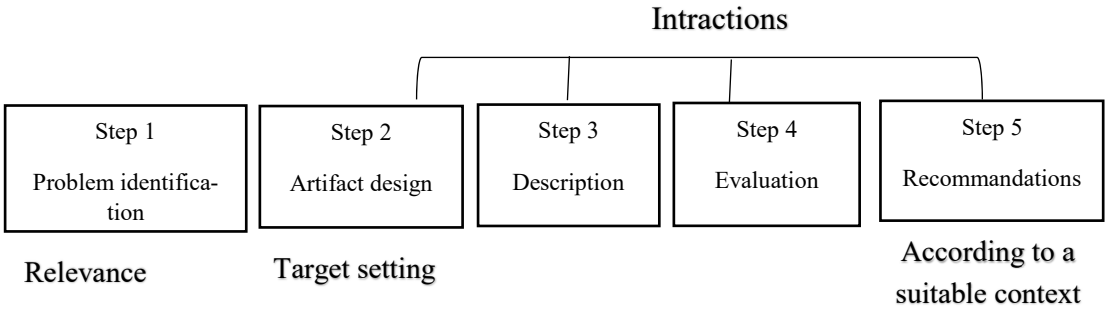


Figure 4: Research design
(Source: Adapted from Hevner et *al*., 2004)

The use of the Hevner et *al*., (2004) model is motivated by the desire to improve the business environment by introducing technological innovations.

This design starts with the identification of the problem that dominates within the companies. It consists in determining the problem and finding its relevance in the functioning of the company. Within the framework of this research, the problem is related to the management of information flows within the supply chain of the retail companies in Cameroon.

The second stage (Artifact design) consists in providing a solution model based on technological innovation and in this case the solution is the implementation of digitalization throughout the supply chain of retail companies.

The third step consists of the description of the digital solutions proposed within the supply chain of these companies by considering all the links.

The fourth step is the evaluation of the proposed solutions in order to assess their usefulness, quality and efficiency. To this end, the evaluation of this study was done by analysing the cases considering each link of the supply chain in order to see how digitalization could affect the different links.

And finally, the last step is the recommendation, which consists of practical recommendations for companies. In this research, the recommendation stage is carried out by a concept development of digitalization within the retail supply chain that considers the company's objectives, requirements, opportunities, threats and challenges. This last step provides practical recommendations on the process of supply chain digitalization.

2.3 Conceptual Framework of the Digitalization of Information Flow within the Retail Supply Chains

A successful supply chain operates with a clear vision of strategies and activities. In the field of digitalization of information flows within the supply chain, the literature has been used to define the path to follow in order to develop a suitable framework. A conceptual framework for analysis was developed based on the literature and theory review. This framework assumes that better communication and cooperation through digital innovations and digital information flow management leads to a more economical, efficient, reliable, customer-oriented, and environmentally friendly supply chain.

According to the literature, several theoretical models have been used for the adoption of digital technology. Indeed, in many studies, the widely applied and highly successful models are those of Davis et *al.,* (1989) The technology acceptance model (TAM), Roger's (1995) Diffusion of innovation (DOI), Tornatzky and Fleischer (1990) technology-organization-environment (TOE) framework and Venkatesh et al (2003) unified theory of acceptance and use of technology (UTAUT). The TOE and UTAUT are used to understand the human, technological, organizational, and environmental factors that influence the implementation of new technology.

Therefore, in this research, the combination of the TOE and the UTAUT will be used as a framework. In fact, research TOE was founded in 1990 by Tornatzky and Fleisher. It describes the factors that influence the adoption of new technology by organisations and the process of

implementing technological innovation. They demonstrated that the implementation of new technology is influenced by technological, organisational and environmental factors.

Technological factors include the availability of technologies both internal and external to the company and their characteristics. As far as organisational factors are concerned, these include the size of the company, the communication process set up for the activities internally and with the different stakeholders, the human resources in terms of skills and the links between employees (whether formal or not) and finally, as far as environmental factors are concerned, they include competitors, market structure, infrastructural support and government regulations. These three groups of elements influence the way an organisation adopts a new technology.

As for UTAUT, it was developed by Venkatesh et *al*., (2003) based on 8 theories (Theory of Reasoned Action (Fishbein and Ajzen, 1975); Technology Acceptance Model (Davis, 1989); Motivational Model (Davis, 1989); Theory of Planned Behavior (Ajzen,1991); Combined Technology Acceptance Model and Theory of Planned Behavior (Taylor and Todd, 1995); Model of PC Utilization (Thompson et *al.,*1991); the theory of diffusion of innovation (Rogers,1995)), which had been developed to identify the factors determining the acceptance of new technology. Based on these different theories, they developed the unified theory of acceptance and use of technology revealing four factors that determine the acceptance of new technology: performance expectation, effort expectation, social influence, and enabling conditions.

Moreover, these two theories are useful in this research in order to understand the process of implementing digitalization, measure its degree of acceptance by the individuals concerned, and evaluate its effectiveness.

Indeed, the TOE framework makes it possible to identify opportunities and constraints faced by companies facing a new technology to judge its technological, organizational, and technological effectiveness. To understand the changes that digitization brings and where these changes occur in the chain, which is why the TOE and UTAUT framework is applied in this research.

By determining a definition of digitalization that is applicable to the retail sector, in particular, it is possible to propose a structure that allows building a digital supply chain for this type of company. The current trends in digitalization, success factors, technologies, challenges, and expectations of digitalization have been clearly identified by reviewing the existing literature in order to determine a suitable framework for the digitalization of retail companies.

Using this framework, most supply chain managers will be familiar with the basic approach to supply chain digitalization and will be able to assess the effectiveness of digital tools, establish a vision for their implementation, and develop a roadmap for effective supply chain management. The implementation of the digital supply chain needs further research based on well-defined cases and considering contexts that are very different from one environment to another.

This section presents the structure of the implementation of digital tools throughout the supply chain, particularly in the retail sector. The figure 5 presents the framework for the implementation of the digitalization of information flows in the supply chain based on the review of the literature.

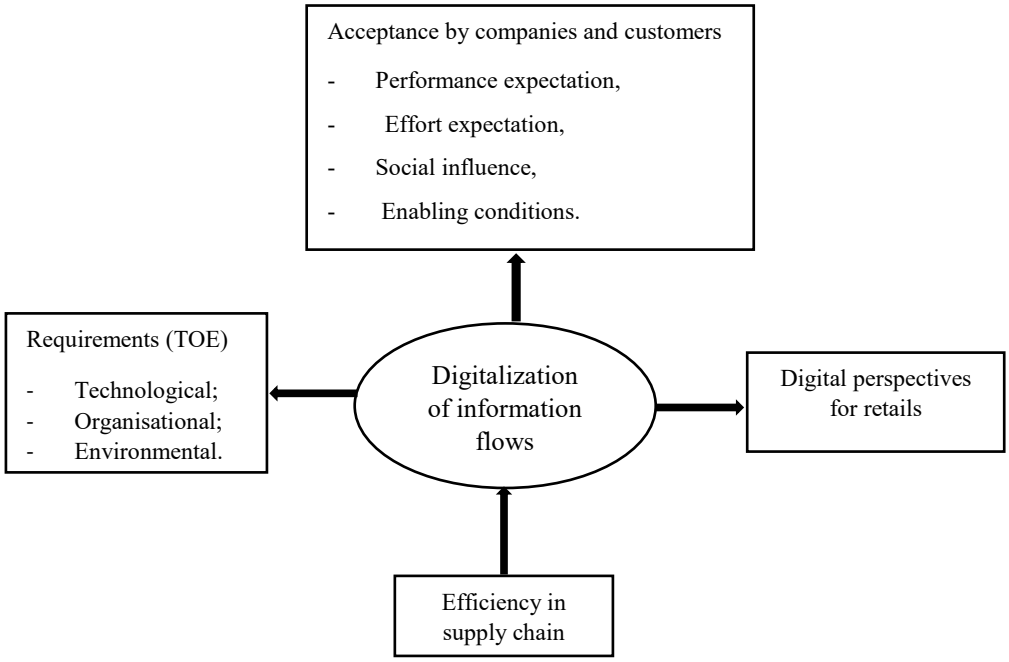


Figure 5: Framework for the digitalization of information flows

(Source: Author´s own elaboration)

2.4 Conclusion and Summary of the Chapter

Overall, this chapter describes the methodology used to conduct this research. Indeed, it is the Design Thinking method. This method consists of three phases: comprehension, exploration and materialisation. In order to understand the phenomenon of digitalization, a systematic

review of the literature was carried out in order to identify in-depth the phenomenon under study, then a detailed observation of the functioning of the supply chain of retail companies in general and that of Cameroon in particular and finally an interview phase in order to identify and clearly define the problems encountered within the companies in Cameroon. The result of the literature review identified trends in the management of information flows within the supply chain, it appears that in developed countries the debate is no longer on the management of information flows within the supply chain but on the transformation of the supply chain into Supply Chain 4.0. During the literature review, no literature on supply chain digitalization was found in the Cameroonian context (at least in the used databases), this is because it is a new phenomenon in the Cameroonian context. Nevertheless, it allowed designing the interview guide for the different interviews, interviews having revealed the main problem which is related to the bad management of the information flows within the supply chain, which has consequences on the whole company. In the exploration phase, the case study was used to study the identified problem in-depth and to propose solution ideas adapted to the context of the study. In the last phase, the materialisation phase, different scenarios were developed to test the feasibility of the proposed solutions. In order to implement the appropriate solution, a concept development was proposed. Indeed, it is a concrete plan for the implementation of the digitalization of the supply chain within the companies implemented in Cameroon

Chapter 3: Analysis and Evaluation of Digitalization in Retail Supply Chains

Digitalization is a term that has been in fashion for a couple of years. it is defined by the strategy site.fr as the "digitization of the offer and of all the chain of creation of the value". Today there is more and more talk of digitalization within the company. Indeed, with the popularization of computers, smartphones, and tablets, the evolution of lifestyles and consumption modes has been observed. In the field of logistics, in particular, digitalization is becoming more and more important because of the changes it brings to the process of executing activities.

3.1 Characterization of Digitalization

There seems to be quite some confusion concerning the use of concepts such as digitalization and digitization. In the Oxford English Dictionary, digitization refers to the conversion of analog data into digital form. However, digitalization refers to the adoption or increase in the use of digital or computer technology by an organization, industry, or country. From these definitions, it can be said that this is the concept of digitalization that will be treated throughout this thesis because, in this work, it is the question of talking about the technologies used by companies throughout their supply chain to manage their information flow.

When reviewing the literature about digitalization, many authors have defined this concept. According to Brennen and Kreiss (2014), digitalization defined as the adoption and use of digital and mobile technologies involves not only investment in those technologies but also training and actual usage. Regarding Yoo and *al*., (2010), Digitalization is understood as the transformation of socio-technical structures that were previously mediated by non-digital artifacts or relationships into ones that are mediated by digitized artifacts and relationships. Digitalization means the use of digital technology and data in order to create revenue, improve business (not just process), and create a digital culture whereby digital information is as the core (i-scoop.eu).

By those definitions digitalization refers broadly to the integration of digital technologies into everyday life. Digitalization refers both to a transformation from analog to digital and to the facilitation of new forms of value creation (accessibility, availability, and transparency). As

part of this thesis, the definition according to which digitalization is the integration of the digital support of work in the realization of the tasks has been retained. In the field of the supply chain, digitalization will manifest itself through the use of numerous digital work media.

In reviewing the literature, it appears that the digitalization is conducted by the use of several carriers that can be classified in a different way according to different authors. According to Hanifan (2014), the digitalization supports are Analytics, Mobility, Social, Internet of Things (IoT), and Cloud. Morabito (2014) uses Big Data as support instead of analytics. Moreover, Kuhlmann and al., 2017goes further by showing that digitalization is driven by technological advances through the use of the following tools: Information Technology and software (cloud, mobile, and Artificial Intelligence), robotics, and sensor technologies (RFID) and finally IoT. Indeed, these media guarantee the availability of a large amount of information. Through the cloud and big data this information is stored, available, and accessible throughout the supply chain and can be shared between the actors of this chain. The IoT for its part is particularly associated with the identification and traceability through the integration of Radio Frequency Identification Systems (RFID) and Near Field Communication (NFC) whose uses are many such as product traceability, management of the production chain, management of subscriber in transport and recreation, electronic payment (Gnimpieba and *al*., 2014; Jahn and *al*., 2017). The social allows the organization to share its information and analysis with stakeholders (Hanifan, 2014 and Morabito, 2014). And finally, the Artificial Intelligent and robotics allow automating the activities and processes.

3.2 Elaboration of Digitalization Steps of the Retail Supply Chains: From Digitization to Digital transformation

3.2.1 Difference between Digitization, Digitalization and Digital Transformation

With the rise of digital tools, many terms have also emerged in the field such as digitization, digitalization and digital transformation. These terms are often used interchangeably, even though they are completely different.

Digitization refers to the transformation of analog data into digital form. Digitization allows the company to be more efficient. The transformation of analogue data into digital data allows the company to create a usable digital database. Thus, digitization consists of the optimization

of internal processes (work automation). Digitization results in the reduction of costs related to manual work, time, costs related to storage (Bogush, 2021; Ritter and Pedersen, 2020; Bloomberg, 2018; Brennen and Kreiss, 2016).

On the other hand, ***Digitalization*** is the use of digital technologies and digitized data to change the way people work. Digitalization creates value by improving the existing process and the business process. Digitalization goes beyond the mere use of technology, it is a strategy that brings about profound changes in the business model and introduces innovation in the way of working. It allows the company to be more efficient and productive (Bogush, 2021; Ritter and Pedersen, 2020; MaryAnne Gobble, 2018; Brennen and Kreiss, 2016).

In short, digitalization and digitization are linked because digitalization cannot happen without digitization.

However, ***Digital transformation*** requires a broader adoption of digital technology. Digital transformation is not just about digital technology, it is more about people. Indeed, the organisation seizes every opportunity offered by digital technologies to change the global approach. It requires customer-focused organisational changes, supported by leadership, driven by radical challenges to corporate culture and the use of technology to empower and develop employees (Bogush, 2021; Bloomberg, 2018). The Table 3 summarize the fundamental differences between digitization, digitalization and digital transformation.

Table 3: Difference between *Digitization*, *Digitalization* and *Digital Transformation* (Adapted from Bogush, 2021)

	Digitization	***Digitalization***	***Digital transformation***
Goal	Encoding information	Information processing	Leveraging knowledge
Objectives	Convert of analog to digital	Automating business processes	Changing the organisational culture to focus on customers
Tools	Computer and encoding equipment	IT systems and Applications	New and disruptive technologies: Robotics, AI
Challenges	Volume (Material)	Cost (Financial)	Resistance to change (Human resource)
Example	Netflix has turned the cassettes into digital CDs to improve the quality of the films.	Netflix supported its customers by allowing them to select the CDs of their choice on its website before delivering them to their homes.	Netflix has turned DVDs and CDs into an online streaming platform to which users must subscribe to watch films. In addition, thanks to the machine learning and big date analytics, Netflix offers films based on the user's history.

3.2.2 Digitalization Steps of the Retail Supply Chains

Digitalization has started with the use of simple tools for the management of daily routine tasks, from tools that help the information management cycle (Moraes and Laurindo (2003); Rodrigues, et *al*., (2009)) to numerous technological innovations. These stages are divided into three groups: Digitization, Digitalization and Digital Transformation. In fact, the first step corresponds to digitization, the second and third steps correspond to digitalization and finally, the fourth and fifth steps correspond to digital transformation.

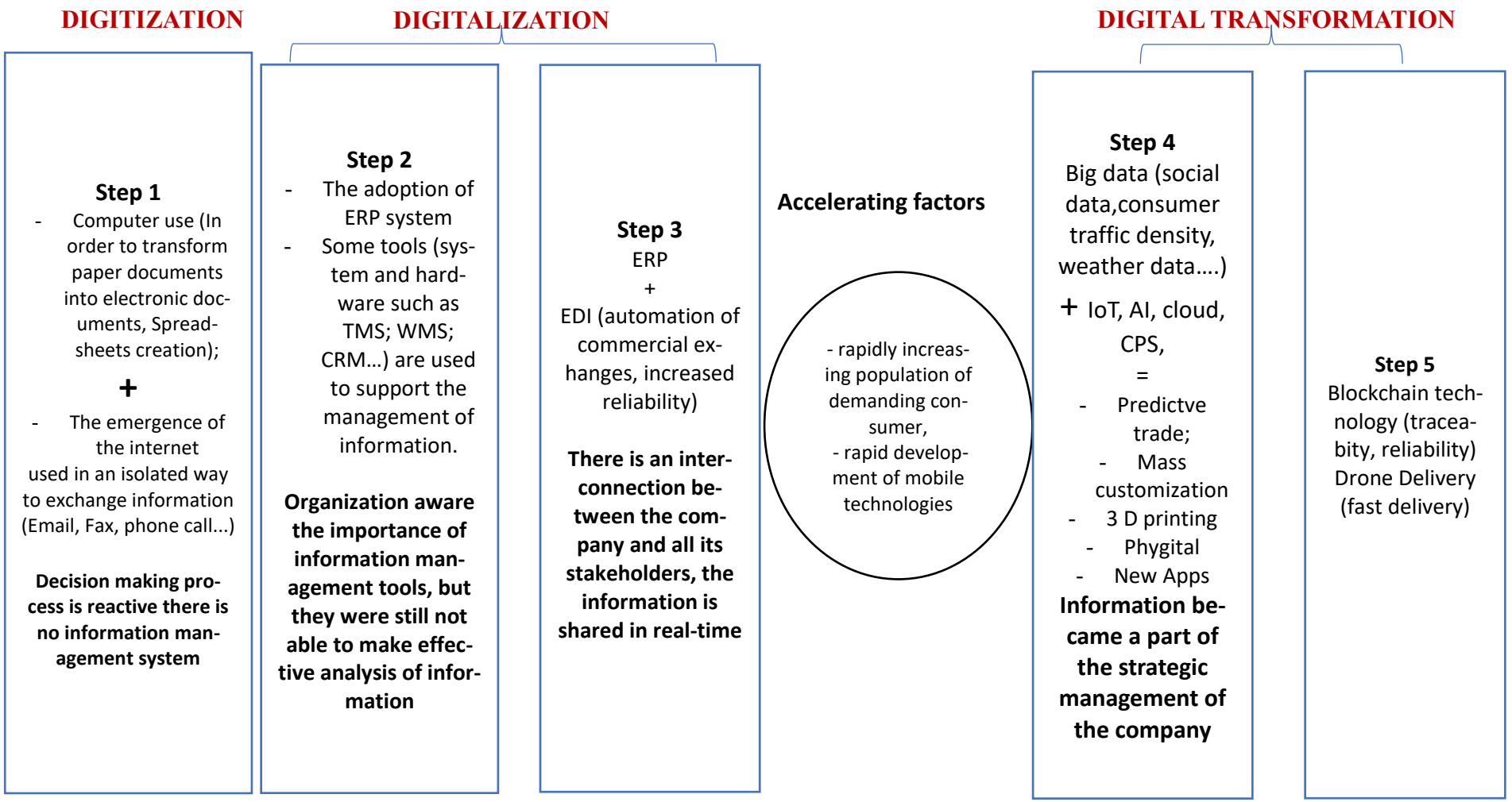


Figure 6: Overview of the digitalization process of the retails supply chains
(Source: Author´s own elaboration)

Digitalization, which began a few years ago with the simple use of a computer, has evolved a lot and now includes "information processing, which means: creating, producing, analysing, processing, retrieving, storing and transforming information in general". This processing encompasses the Internet, e-mail, data storage, network communication and security, fax, video conferencing, software, hardware, telecommunications and applications (Porter and Millar (1985); Seyal et *al*., (2000); Brady et *al*., (2002); Akan (2003); Pinto and Silva (2005); Sharman and Bhagwat (2005)). (2006); Barba-Sánchez et *al*., (2007); and Pinho et *al*., (2014)).

Digitization

Step 1: In the first stage, companies have recognized the importance of information flow management tools organizations but work in isolation, and use them only for responding to routine activities (e-mail, spreadsheets, text editors, etc.) (Magalhães Pessoa, 2017).

Digitalization

Step 2: In the second stage, companies realized the importance of information and started using tools to better manage their operations. Among these tools is the ERP (Enterprise Resource Planning) system to manage their internal information flow, as the ERP system allows the information to be updated in real-time. In fact, there is a single database for the whole company and all departments or services have access to the updated information. The ERP system has evolved and undergone several expansions that allow managing various company activities among them, the most important directions are Advanced Planning and Scheduling (APS), Demand Planning and Revenue Management (DPRM), Customer Relationship Management (CRM), Sales Force Automation (SFA) and Supply Chain Management (SCM), Transport Management System (TMS), Warehouse Management System (WMS) (Nair and Bhanu Sree 2017; Gnimpiecba et *al*., 2014). At this level, real-time communication between departments is then effective and companies are now looking for interconnection with other stakeholders and automation of activities, hence the third step.

Step 3: The search for automation and integration of the supply chain has led companies to EDI (Electronic Data Interchange). EDI is defined by Emmelhainz (1990) as the organization-to-organization, computer-to-computer exchange of company data in a structured, machine-processable format. EDI enables paperless communication between companies to facilitate the

procurement process to take place (Kotzab, 2005). According to him, there are three components of EDI: EDI-enabling software, which translates input and output messages into a specific format, communication, and network, and standard messages, which ensures electronic exchanges between the different partners, so that the computers involved are able to exchange information at the highest level in an organization.

The use of Electronic Data Interchange increases the reliability of exchange information, as this data is transmitted automatically and is therefore not subject to manual manipulation which could lead to errors. This reliability increases the efficiency of the supply chain.

These first three steps focused on the company and its partners. However, certain factors have accelerated the passage from step 3 to step 4.

These include intense competition, cost pressures, short-term demand and volatile demand patterns (Taleghani et *al*., 2011), rapidly increasing population of demanding consumer, rapid development of mobile technologies. To meet these challenges, supply chains need to become smart. Supply chains can no longer be repositioned overnight to buy, manufacture, move or sell the right items in the right quantities and locations (Wu et *al*., 2016).

Digital transformation

Step 4: In the face of these changes, which are rapidly occurring in all commercial environments and industries. Companies have realised that information has become a strategic part of business management (Magalhães Pessoa, 2017). As a result, companies have expanded their source of information by considering various sources (social data, supply data, customer data, market data) (Girard, 2012) to form a single database called Big Data. Thus the associated Big data has other new technologies such as IoT, Autonomous Robotics, AI, Machine learning (has brought several trends in the supply chain of the retail companies such as Predictive trade, Mass customization, 3D printing, Phygital, New Apps (Bala, (2012); Addo-Tenkorang and Helo, (2016); Lamba and Singh (2017); Arunachalam et *al*., (2018); Nguyen et *al*., (2018); Govindan et *al*., (2018); Hofmann and Rutschmann (2018)).

Faced with these innovations, consumers are also becoming more and more demanding in terms of traceability and delivery time which brings these companies to stage 5.

Step 5: To ensure the traceability of the products they sell, retail companies have started to implement blockchain technology to allow all stakeholders to have information at every stage until the product is delivered to the customer. It also allows the final customer to intervene by

giving his opinion on the process. In fact, the traceability stems from the ability of blockchain to provide immutable data. It is mainly seen as an opportunity to exploit existing supply chain resources and skills (Hald and Kinra, 2019).

The blockchain is important whether it is on the side of the company or the side of the final consumer. Indeed, it allows all members of the supply chain to trace the history of transactions (Kewell et *al*., 2017). On the customer side, it enables an indelible record of the precise history of a product to be attached (Koonce, 2017).

As far as delivery is concerned, delivery by drone is currently being tested. Like Amazon, which is testing the technology, but it is not yet widespread.

Finally, digitalization in the retail supply chain in a developed country is discussed in terms of Big Data, IoT, Cloud, Social media and Apps. Some of them aim to collect and store the data, the others are used to analyze these data, and some to share information useful for decision making and bring innovations.

3.3 Description of the of Digitalization Pillars

Digitalization is driven by 4 main technologies whose contributions to the supply chain will be shown.

3.3.1 Big Data

Big data is a term that describes a high -volume, high velocity, and high -variety information assets (structured, and unstructured data (image, video, audio)) that has the potential to be mined for information and used in machine learning projects and other advanced analytics applications, necessary for decision making. The term big data has technology and processing background in an increasingly digital and unstructured information age where ever-larger data sets became available and ever more data sources where added, leading to the real data.

Big data is often characterized by 3Vs (Volume, Velocity, and Variety) were first identified by Gartner in early 2001. Later IBM added more Vs (Veracity, and Value).

- *Volume:* the first characteristic concerns the unmatched quantity of data actually available and storable by businesses (terabytes or even petabytes), through the internet (IBM, 2013).

There is more and more an increase in the size of the data to be managed in today's businesses. these data are generated internally by employees and externally by partners and customers. the sources of data are becoming more numerous and consequently, the volume of data has been growing at an increasing rate.

- *Velocity:* the second dimension concerns the dynamics of the volume of data, namely the time-sensitive nature of Big Data, as the speed of their creation and use is often (nearly) real-time (Morabito, 2014). Velocity is about where capture, analysis, processing speed, and the mechanisms required to process a large volume of data in order to provide useful information in real-time.
- *Variety:* refers to the types of data actually available. in addition to the structured data, it also concerns unstructured data ranging from text, log files, audio, video, and images posted. Big Data uses data collected from all possible sources, which makes processing more complex and requires the use of sophisticated tools.
- *Veracity*: is about the reliability and accuracy of the data. It refers to the quality and confidence of the data available because of the large volume, speed, and variety (Morabito, 2014). This characteristic is therefore relevant for the strategic use of Big Data by companies, for decision-making based on accurate, reliable, and correct information.
- *Value:* characteristic of Big Data is the purpose, the result, the prioritization, and the overall value and relevance created in Big Data applications. The value does not usually reside in the data volume, so this new dimension has been added.

Within the supply chain, the data that makes up the Big Data is 95% unstructured - that means that a large volume of data comes from the many sources and devices used in all supply chain processes. The information management system is a great source of data that is the basis of Big Data. The remaining 5% comes from the different transactions within the company and also information from other different external sources.

The figure 7 gives 3 categories of data within the supply chain according to their degree of variety, level of structure, volume, and velocity.

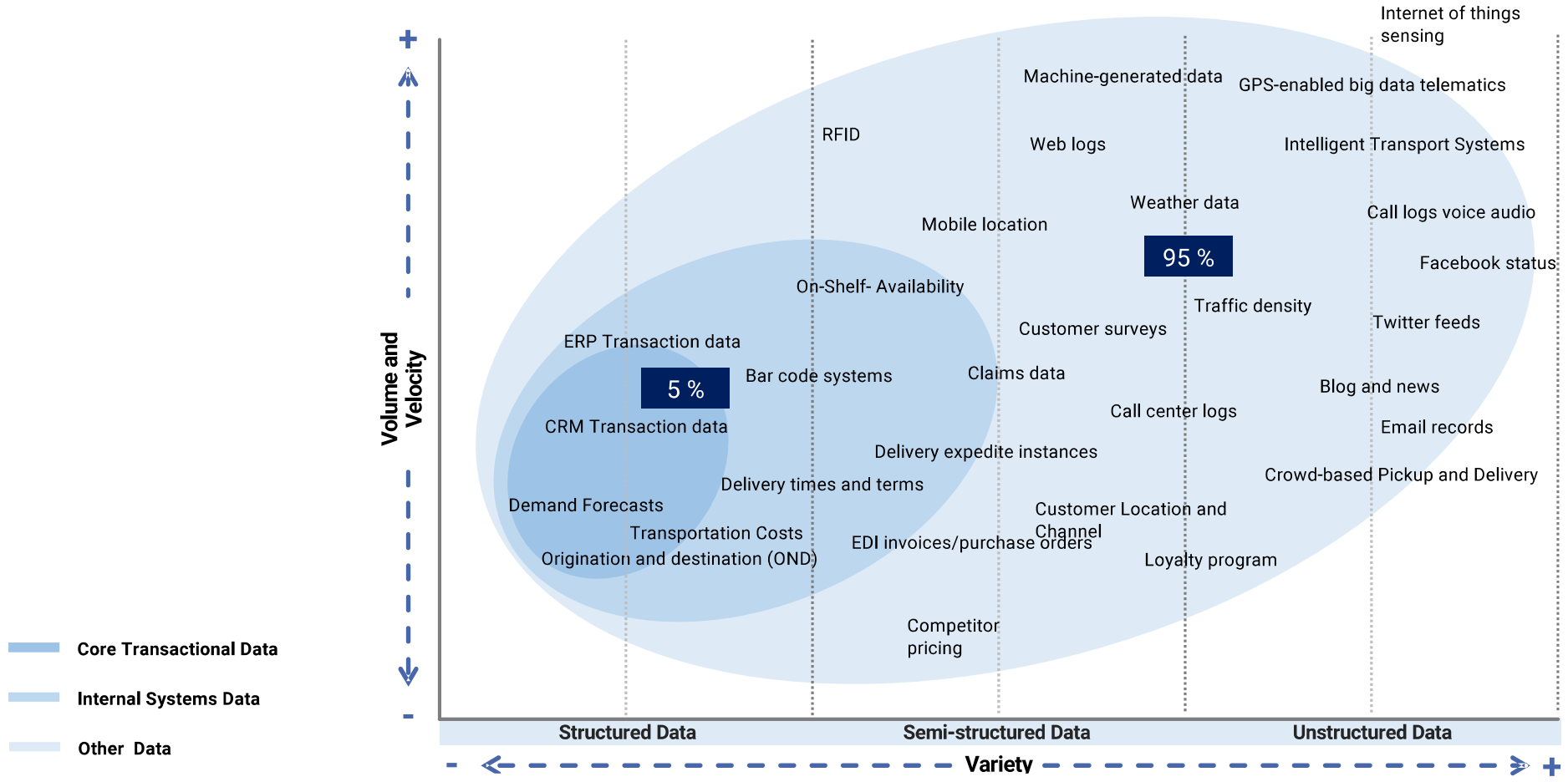


Figure 7: Data Categorization

(Source: Kinra, 2020)

Looking at this graph (figure 7), it appears that within the supply chain, structured data is in very low volume and this data is at the heart of the different transactions within the company, they are related to the demand, transport, customer relationship management. Moreover, as data becomes less structured, its volume increases as its sources become very diverse, some come from the supply chain management system set up by the company (ERP system, bar code system, ...) and others come from different sources related to the environment (social media, customer survey, weather data, ...). Unstructured data are numerous and varied and it would be necessary for the company to analyze these data by applying different algorithms in order to transform these data into information likely to help in decision making.

In particular, within the supply chain of retails companies, Girard (2012) has distinguished 4 sources of information and the channels through which this information is obtained in each source. These sources are social data, customer data, supply data, and market data.

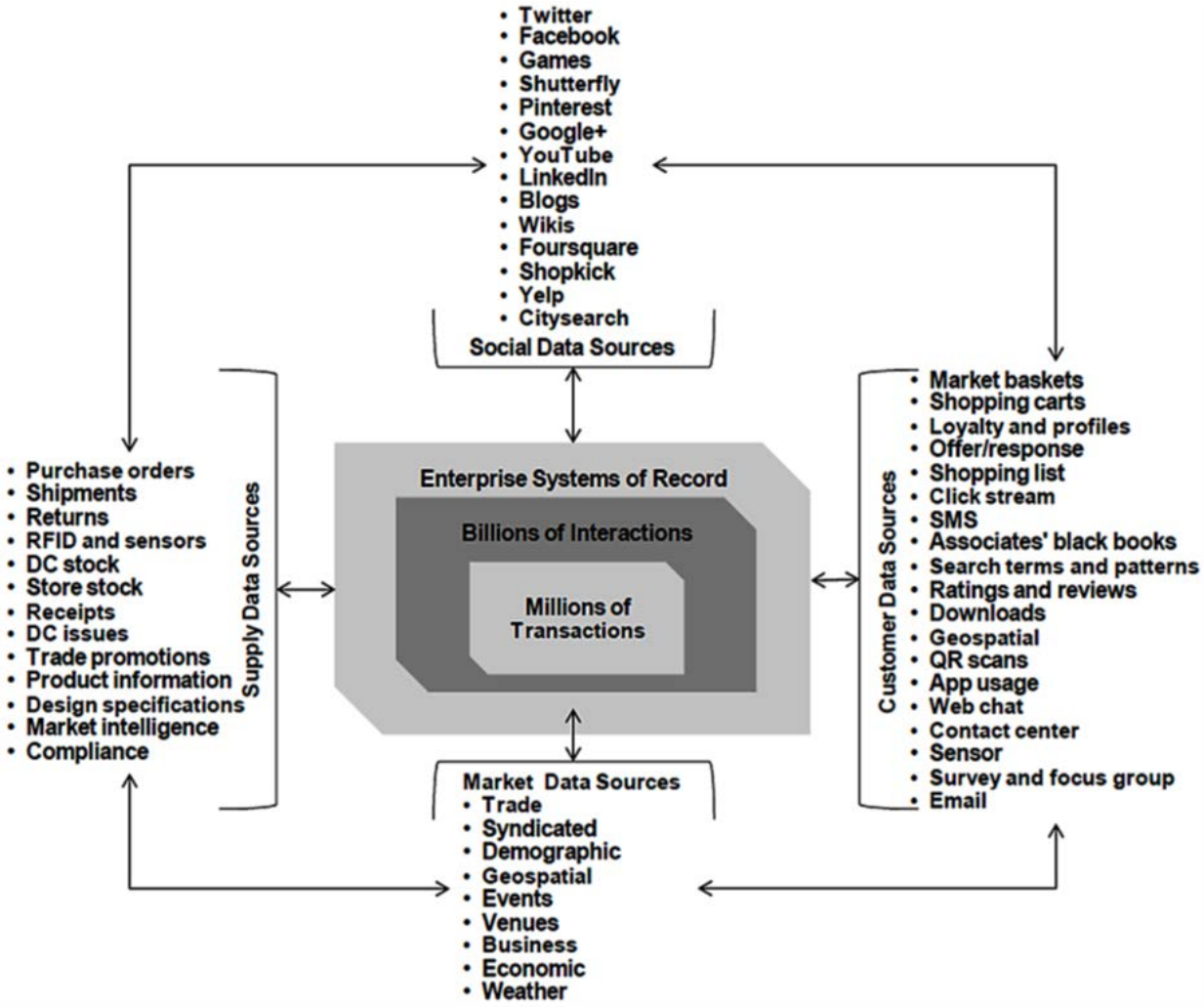


Figure 8: Data sources for retail companies
(Source: Girard, 2012)

Big data is a high-volume, high-speed, and/or wide-ranging information asset that requires new forms of processing to enable improved decision-making, knowledge discovery, and process optimization (Cecere, 2012).

To make a good decision, companies are gathering a vast amount of supply chain-related data with the help of technologies such as sensors technology (RFID), Barcode, and GPS (House, 2014). According to Harvard Business Review, 2013 Big Data Analytics offers companies the ability to leverage the enormous amounts of data driving in other to transform them into useful information for making the decision in their global supply chains (Saurabh B, 2016). In general, throughout the supply chain, Big data is important whether it's the supply side or the demand side. on the supply side, companies can use big data thanks to accurate information to optimize their activities such as a new product introduction, production plan, inventory management, and product distribution, in other to maximize customer value and revenue (Cecere, 2013). On the demand side, Big Data allows companies to respond quickly to changes in demand thanks to the information provided in real-time. With Big data, companies can confidently cut inventory without affecting the customer service level, thereby reducing working capital requirements (Chase, 2013).

In particular, in the retail sector, companies developed big data specific strategies. these big data bring together all the information from many sources and can be leveraged for understanding customer needs in other to satisfy them because the most important drivers of organizational success are to understand the customers (LaValle and al., 2010).

3.3.2 Cloud Computing

The National Institute of Standards and Technology (NIST) defined Cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can rapidly be provisioned and released with minimal management effort or service provider interaction. It also refers to using software that is owned, delivered, and managed remotely by a third party on a pay-for-use basis or as a subscription (Harvard Business Review, 2015). Cloud computing is emerging as a technology for optimizing IT costs and supporting agility. According to Mell & Grance (2011), the cloud model is structured by five characteristics: on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service.

On-demand self-service: it is self-allocation of cloud services by the user (s) to be available when needed.

Broad network access, which allows the user to access the cloud computing resource from different platforms, such as mobile phones, laptops, or PDAs (Morabito, 2014).

Resource pooling refers to the possibility to reach the files and applications from everywhere through the network.

Rapid elasticity indicates that virtual resources evolve rapidly and, almost limitless and can also be adapted automatically to changes.

Measured service, refers to the Cloud services being automatically measured and that the results are transparent for the users. The use of resources can be measured and monitored. For example, for billing or auto-scaling.

Regarding Ferguson and Hadar, (2011), the cloud can be defined according to the user's ability to use the hardware, software, and network infrastructure. For this purpose, he identifies three levels of cloud service: SaaS (Software as a Service), IaaS (Infrastructure as a Service), and PaaS (Platform as a Service) (Fellows and Piraino, 2010).

SaaS is a software representation in which applications are hosted by a provider or service provider and these applications are available via the Internet. PaaS is sometimes called "cloudware" because it transfers resources from the user's machine to the cloud. PaaS is a model for transporting operating systems and associated services over the Internet without installation. IaaS is another important data center resource, such as storage space, physical servers, switches, firewalls, and routers, whose resources are largely unused in the cloud. The goal is to have a data warehouse cloud (Yinglei and Wang 2012).

Today the cloud has become very popular thanks to the growth of mobile applications.

The cloud in one way or another brings changes to all the elements that make up the supply chain.

In manufacturing, it allows data to be synchronized so that the optimal quantity to be produced can be determined. It also makes it possible to work with less paper in the warehouse thanks to data synchronization that can be accessed anywhere and at any time with mobile phone technology. The tracking and tracing of shipments through many applications have also changed the field of transport and contributed to the elimination of geographical limits. Thanks to the data accessible via the cloud, the production process has become more personalized due to the

analysis of the data contained in the cloud. The existence of the cloud allows all stakeholders in the supply chain to have real-time information wherever they are.

The cloud allows the monitoring of the performance in the company for better decision making. In addition, the benefits of the cloud in the supply chain can be summarized as follows:

- Cost reduction the company no longer needs to set up a data center, as this means that there is no staff to manage and administer the data, which means less burden on the company;
- Optimization and efficiency: the cloud allows to optimize the movement of products, delivery times, and market expansion through automation;
- Accessibility and flexibility: the cloud allows for accessibility from any location and reduces geographical limitations by allowing a connection to the supply chain in any geographical area. Flexibility enables quick decision making to know what needs to be done and when it needs to be done. When an error occurs, the cloud service provider is willing to help solve the problem at any time because there is real-time visibility.

3.3.3 Internet of Things (IoT)

IoT refers to various computer equipment such as sensor technology, readers (Radio Frequency Identification, barcodes), short-range location and communication systems based on machine-to-machine communication (M2M), through the internet network, to form a larger and smarter network (Yuxi, 2012). The main idea behind the IoT is to allow devices to communicate with each other without human intervention. It is used to connect things and to store data in the cloud (Rogetzer and *al*., 2019). IoT aims to connect objects via internet protocols.

The birth of IoT dates back several years. It has been created in the context of RFID and NFC whose use is multiple: product traceability, production chain management... Due to this technology, it is now possible to track items in various operations such as supply chain management and logistics.

Gnimpieba and al., (2014) identify three technologies for communicating an object with the internet, including Radio Frequency Identification, Near Field Communication and the Zigbee communication protocol.

Radio-Frequency Identification (RFID) is a new generation technology consisting of a reader/label pair intended to set up the optical reader of the barcodes of marked objects. it´s a technology that uses electronic tags placed on the objects to replay information to an electronic

reader by means of radio waves. RFID is mainly used in the retail sector where optical scanning is ubiquitous. it also easy management of logistics and especially the efficient management of stocks and promotes high reliability by eliminating all human errors.

Near Fields Communication (NFC) is the result of several developments in microcontrollers, smart cards, and short-range communications (Olonibua et *al*., 2013). it is based on the same principle as RFID, ie identification by radio frequency. It allows the exchange of information between two objects at a short distance without contact. It operates according to the active or passive mode. Depending on the active mode, the terminal acts as a reader of electronic labels (barcode) and has its own source of energy. In the passive mode, the user's terminal mimics a smart card and acquires energy radiation from the reader (mobile phone) (Yuxi, 2012).

Zigbee is a wireless communication protocol that allows the exchange of data at short distances between nodes of a WPAN network. it can be used for data transmission between logistic objects (containerized sensors, RFID tags on products) and cloud environments (data processing, big data, web services) (Olonibua et *al.,* 2013).

Within the supply chain in general, the IoT has several advantages due to its ability to connect objects to each other without human intervention. According to Manners-Bell and Lyon (2019), its benefits are as follows:

- Monitoring the status of assets, parcels, and people in real-time;
- Measuring how assets are performing and predicting the future;
- Reducing cost by optimizing process;
- Automating the business process to eliminate manual intervention;
- Optimizing how people, system, and assets work together, and coordinate their activities;
- Applying analytics to identify wider improvement opportunities and best practices;
- Monitoring inventory to reduce stock-outs.

The IoT has an unparalleled ability to provide data at a high level from all aspects of the supply chain. From the level of consumer behavior, from their needs, through the location of the product in the stores, to the tracking of vehicles as products are transported across continents. All these activities generate a significant amount of data thanks to the interconnection of objects through the existence of several tools. However, this information is only useful when it is analyzed and processed. This is where artificial intelligence plays a key role. Moreover, AI applied to the supply chain allows for flexibility in deliveries, implementation of automated vehicles

such as drones in the supply chain, automation of warehouses, creation of a new category of consumers "connected consumers". In short, in the supply chain, AI allows us to predict events in order to prescribe appropriate actions. It allows the supply chain to self-correct by adapting to any change in circumstances.

3.3.4 Social Media

The business world has evolved a lot in recent decades. Today, it is developing in network mode due to the speed of communication and the direct contact between the various actors involved. According to Sinha (2015), many companies use networks to establish ongoing communication both internally and externally. These social media allow interaction and communication in real-time pieces of information useful for decision making. The most popular social media professionals are among others Facebook, Twitter, Linkedin (it is a business and employment-oriented service that operates via websites and mobile apps. Founded in 2002, and launched in 2003, it is mainly used for professional networking. Through it employers posting job and job seekers posting their CVs).

Using modern technologies, such as social media, improve the organization's supply chain management. It creates more visibility, improves communication, increases control, and reduce operational and labor costs. Indeed, having a more efficient and stable supply chain, makes it easy to enhance customer satisfaction. Social media aims to build relationships and is therefore used in a logistics chain to create and develop relationships between different stakeholders. Data gathered from the use of social media by supply chain partners can provide insight into various issues of the supply chain, industry, competition, etc.

Social media enable supply chain participants to have information in real-time supply chain events and transactions to keep everyone up-to-date with current situations, such as delivery time, delivery delay, a delay in shipping, the receipt, or not of the shipment...

Today it´s possible to post messages on Twitter in order to indicate the shipping needs, to alert an accident or closures road, the departure or the arrival of a shipment from the warehouse. These pieces of information allow companies to avoid some dysfunctions along the supply chain by making some corrective action as soon as possible when a problem occurs. Efficient Supply chain management is all about finding the most way to deliver information, this in order to have good coordination between the physical flows and the information flows. For this, social

media is proving to be an important and effective way for businesses to disseminate this information quickly.

The table 4 resumes the main technologies driving digitalization and gives its importance within the supply chain.

Table 4: Description of the main pillars of digitalization

Technology	Description	Importance in supply chain
Big data	Big data is a term that describes a high -volume, high velocity, and high -variety information assets (structured, and unstructured data (image, video, audio)).	Big Data collects all information from many sources and is used to make predictive analytics, customize offerings, and understand customer needs to satisfy them
Cloud computing	the cloud can be defined according to the user's ability to use the hardware, software and network infrastructure	enables unprecedented visibility insight and flexibility while operating rapidly and scale
Internet of Things	connect objects via internet protocols. (RFID, NFC)	product traceability, production chain management
Mobility	the use of mobile devices in daily life such as: smartphone, tablets, PC…	Portability, Dealing with Issues in Real Time, Precision Monitoring, Affordability
Social media	Enables the interaction and communication in real time of information through Facebook. Twitter, Link…	It creates more visibility, improves communication, increases control, and reduce operational and labor costs, makes easy to enhance customer satisfaction

3.4 Application and Reflexion of Digital Tools within the Supply Chain of Retails Companies

The development of trade within the global market makes supply chain supervision more complex. Distributors are often part of an international supply chain that is a series of stages ranging from marketing through product development and design, distribution, and finally delivery to customers. Today to optimize their supply chain on the international level, many retail companies integrate the physical process with digital data: it is digitalization. For example, in the retail

sector, the world's leader Walmart owes his success by using the digital tools to share their information between the actor of the supply chain (Qrunfleh and Tarafdar, 2014). In fact, digitalization is transforming this long chain into a fully integrated ecosystem, totally transparent for all involved. Digitalization creates a big transformation and requires companies to rethink the ways they design their supply chain, in order to implement industry 4.0 which involves that all the processes in the companies must be digitized.

3.4.1 Digitalization of Supply Chain: from Linear Traditional Supply Chain to Digital Supply Chain Ecosystem

Digitalization has rapidly changed the way the supply chain works. it has moved from a traditional linear chain to an ecosystem.

3.4.1.1 Linear Traditional Supply Chain

The traditional supply chain lacks some of the attributes that are necessary for today's and tomorrow's business requirements. The traditional supply chain consists of a series of largely discrete and compartmentalized steps (Büyüküzkan et *al*., 2018).

The problems associated with the traditional supply chain are the availability of products, delivery time, delivery costs, logistics returns ... have long dominated the traditional supply chain (Dupont, 2013). Considering the operation of a traditional logistics chain: when the company suddenly receives an order, the company adjusts its forecasts to reflect the level of demand. it proceeds to the orders of raw material, which will generate additional costs, then it starts the process of production to finally proceed to the delivery to the final consumer. This whole process takes a lot of time so the customer is not willing to wait and ends up buying a similar product. The company, for its part, has an unsold product and uncovered production costs.

In the traditional supply chain framework, there are several inefficiencies observed due to complex process management: Bullwipp effect, Frictions, Delays, high inventories, high out-of-stocks, Low agility, low transparency and low velocity (Annesley, 2019) as presented in the figure 9.

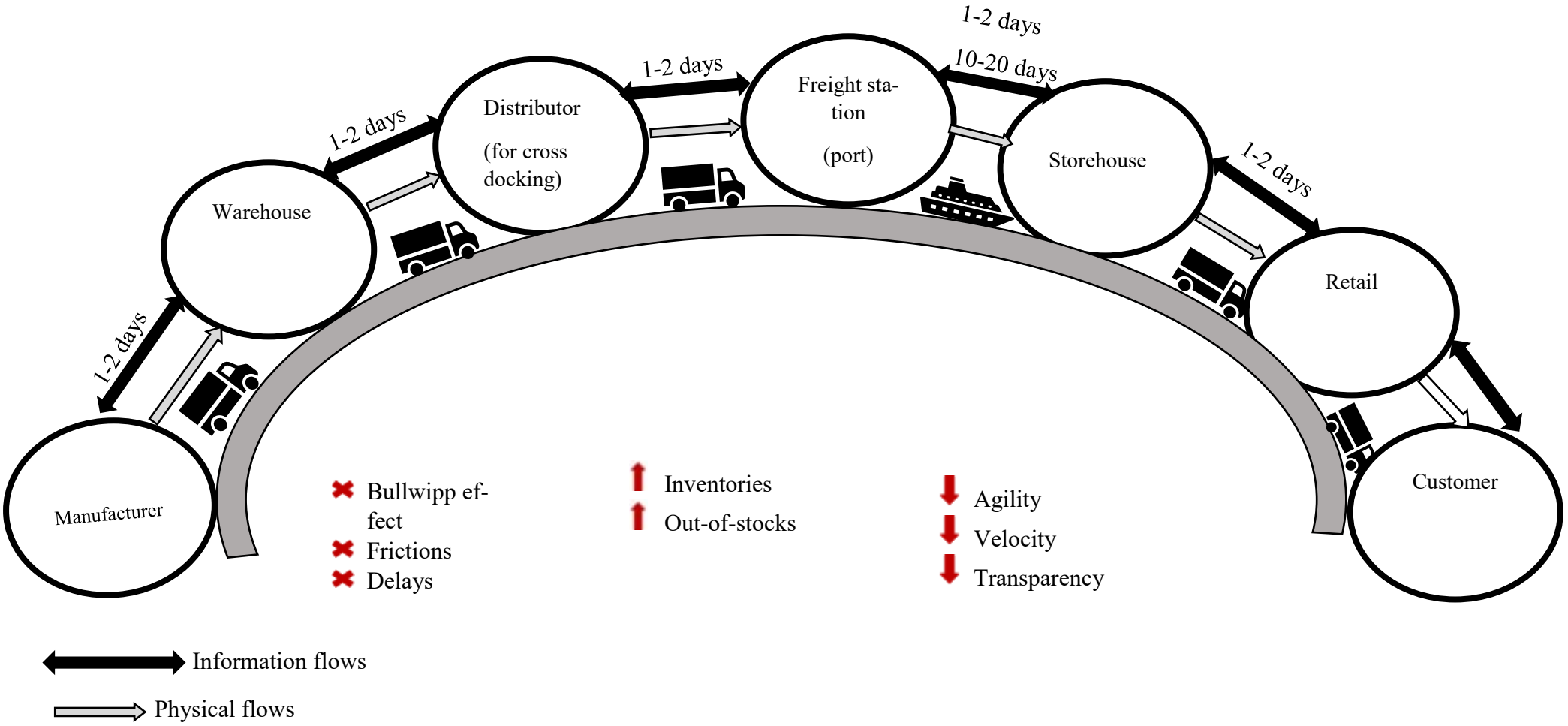


Figure 9: Traditional Supply Chain (before digitalization)

(Source: Adapted from Mrozek et al., 2020)

In this supply chain (Figure 9), the process is linear, there is no interconnection between the different actors of the supply chain. The view is limited to the whole of the supply chain, preventing a significant collaboration. End-customer demand is distorted when information flows along the chain as information is not directly transmitted, and finally the lack of synchronization causing delays (Schrauf & Berttram ,2016).

According to a study conducted by the Boston Consulting Group (BCG) and presented by Sirajudeen (2018), the information flow takes 5 to 10 days for a national supply chain because the information is not received in real-time, from the sending of the information to its reception, it takes between 24 to 48 hours at each stage. This means that the physical flow will take twice as long, as it is at the reception of the information that the process of physical flow begins. For this reason, it is estimated that it will take between 10 and 20 days to replenish the supply. For international supply, often the sending of documents by post takes between 10 and 20 days which means that the total duration of the information flow is estimated to be between 14 and 28 days and this also affects the physical flow. this creates a problem of delay in the traditional supply chain.

Since the supply chain involves several actors, from the producer to the final consumer of the product, a lot of information is exchanged during the supply process. In fact, each participant creates or processes information that would increase the visibility or predictability of the various operations. Given the volume of this information, the manual exchange of this information poses a huge problem in the realisation of activities within the supply chain. The manual exchange of information means that stakeholders are not able to access real-time information within the supply chain, with many consequences.

- For the Producer/ manufacturer, there is a high risk of over-or underproduction due to the lack of information in time, because when information is not transmitted instantaneously and it takes 24 to 48 hours to receive it, The producer will not be able to integrate these changes in time to plan his production in an optimal way and this will result in bullwhip effect, underproduction, shortage of raw material or overstocking, he will also be confronted with inaccurate assumptions;
- For the Distributor, the lack of information in real-time results in delays in the preparation of the retailer's orders and in the delivery of the goods. Since the information is not available

at the right time, it will be difficult to anticipate the demand and therefore to contact the supplier in order to place the order in time;

- Logistics service providers: in the traditional process, the transmission of information by fax and phone call to start the shipping process is very slow and does not allow end-to-end visibility of the cargo being transported. In fact, the shipment of goods by multimodal transport of goods requires steps and controls, but above all numerous exchanges of documents and information between the various parties involved.

In the traditional logistic chain, service providers take care of the transport of goods, warehousing, as they do not have the necessary information management tools to offer other services to their clients. As a result, the traceability of the goods during transport

is not insured and even at the level of the warehouses because there is no information to check if the conditions of conservation of the products have been respected.

- As far as the port is concerned, at this level, there is a problem of traceability of the cargoes of the goods because there is no way to track the containers of the goods. In addition to this problem, there is a problem of cumbersomeness in the process of customs clearance of goods because it requires several documents and it takes more time as the necessary information is not transmitted in real-time. There is only one central computer to supervise all the operations and make plans. As a result, the information is global because there is only an overview there is no specific information for each content of the containers.
- Finally, on the side of the retails companies, the consequences of the malfunctioning of the other links in the chain are stock-outs due to late delivery and a long duration of the supply process, poor stock management of goods due to manual management and a high rate of product loss, as well as a lack of agility.

The traditional supply chain allowed the company to see where the shipment had been according to information from the courier.

In a traditional supply chain, decisions are made on the basis of a reactive approach. This may involve, for example, examining current stock levels within the company and past production requirements to determine retrospectively what components are needed. Data from outside the company, such as distributor stock levels and delivery dates, must be manually processed, which costs time and affects the relevance of the data (Vecchiarelli, 2016).

The traditional supply chain evolution towards the digital supply chain (DSC) allows companies to break down these walls which limit the interaction and connectivity between the different links of the chain so that this chain is transformed into an integrated system that works without fault.

3.4.1.2 Digital Supply Chain Ecosystem

Advances in digital technology are having a huge impact on the world around us and leading to big changes in customer behavior. Today connected customers behave digitally responding to social media trends and taking part in online conversations across a vast interconnected. indeed, many supply chain can keep up and identify the changes in consumer behavior in order to adapt their supply chain in the environment´s evolution.

Due to digital technology (cloud computing, big data, and social media), it is now possible for the company to predict an increase in demand. When the company locates a signal either by analyzing the market data contained in the big data or the information coming from the social networks, it already takes the measures of the increase of the production and updates the plan of production. Upon receipt of the order from the customer, it triggers the production process. the customer can follow the progress of his order from his smartphone or tablet (mobility) and have the information on the delivery date. The logistics chain becomes transparent, flexible, and efficient. Transparency will enable companies not only to react to disruptions but also to anticipate them, model the network, create hypothetical scenarios, and immediately adjust the supply chain as conditions change (Schrauf & Berttram, 2016).

In today's changing global marketplace, supply chains are forced to compete in a rapidly changing environment, where they must either change and be open to innovation allowing them to be in touch in real-time where all links in the chain are interconnected. Companies that have succeeded in achieving a digital supply chain have realised the limitations of their manual systems.

Digital technologies have helped organisations to solve various problems that existed in the traditional supply chain, create new opportunities, gain competitive advantage (Dubey et *al*., 2019a, b) and improve business performance (Chiappetta Jabbour et *al*., 2020).

The use of new technologies in the traditional supply chain with a discrete movement of "plan, supply, manufacture, deliver and return" shifts the supply chain from a static to a dynamic succession (Liotine, 2020). This shift from linear and consecutive production network activities to

an interconnected and open arrangement of supply tasks (Figure 10) is important for organisations that will have to deal with it in the future.

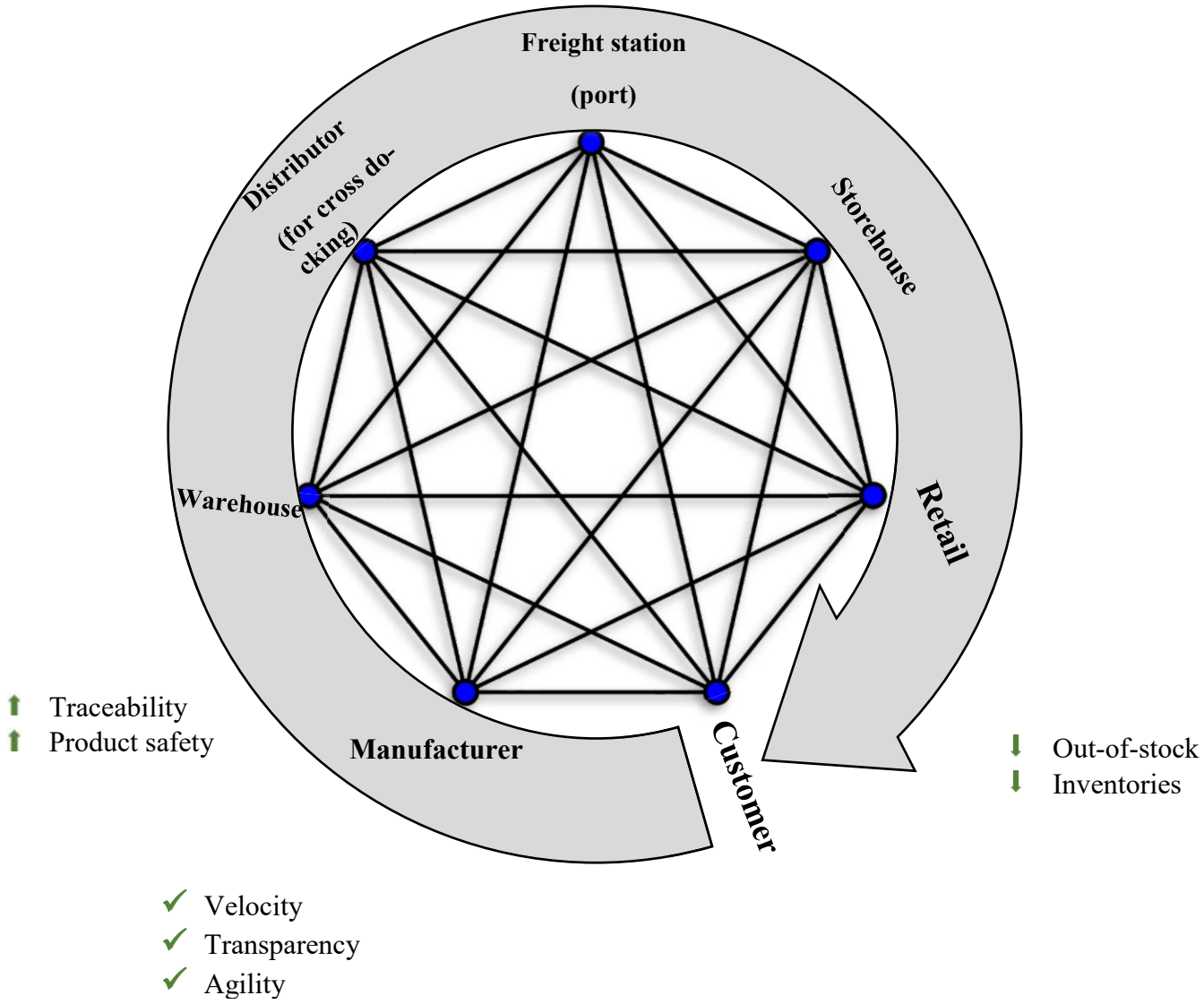


Figure 10: Digital Supply Chain ecosystem
(Source: Adapted from Mrozek et *al.*, 2020)

According to Agrawal and Narain (2018), in the digital supply chain due to the use of new technologies there is:

- Greater transparency leading to better decision making;
- Reduced inventory levels through increased use of just-in-time purchasing;

- Clear visibility of stock levels through a fully integrated system across the value chain.
- More decentralised warehousing to reduce delivery times;
- Reduced delivery times as this will reduce the number of steps in the sales chain;
- A better understanding of customer needs through demand detection and up-to-date sales information;
- Increased sales, higher profit margin, strong customer relationships;
- Improved supply chain flexibility and reduced supply chain risks and costs;
- More alternatives will be available in the decision-making process, enabling better supply chain management decisions;
- Maintaining competitive advantage.

Moreover, since the information is transmitted in real-time, the procurement lead time is 4 to 8 days (Boston Consulting Group) for the national plan. For the international supply chain, the delay will depend on the distance between the country of origin and the country of arrival. The process remains the same, only the transport time changes.

According to Haasis (2020), regarding seaport management, innovations in digital services, based on data analysis as well as mathematical allocation problems and collaborative decision-making concepts, can lead to better capacity utilisation, higher quality of service and cost-effective operations, and can be part of new sustainable business models.

Indeed, digital information management, better communication and coordination between partners in the maritime supply chain, as well as better allocation of scarce resources in line with concerted decision making, will lead to major commercial benefits such as reduced waiting times, better capacity utilisation and more time-efficient processes.

It believes that the use of new digital innovations, such as data-based cloud computing solutions and on-demand service options will enable control of the maritime supply chain, as well as control of port operations.

Thanks to these technologies perhaps in the future a ship moored at a quay will control the terminal operations for its containers, and also a retailer will be able to control the transhipment of the requested containers to the hinterland to transport them to the demanding warehouse according to the product demand specified by the customer and even a container will be able to control some of its operations at the container yard by itself. These cloud-based applications can be operated on a web-based digital services platform in different locations, combined with

digital service innovations updated on the basis of the port community's systems and terminal operating systems (Fibrianto et *al*., (2020), Buer et *al*., (2019), Jahn et *al.*, (2017), Kreeb et *al*., (2017)).

Digitalization generates opportunities for added value to improve supply chain procedures (Nasiri et *al.,* 2020; Patnayakuni et *al.,* 2002).

The supply chain ecosystem is thus versatile and agile, complete view of the supply chain, the information available to all supply chain members simultaneously, and the End customer demand changes are rapidly assessed and integrated. There is a real-time response on the planning and execution level (across all tiers to demand changes if necessary).

The use of information and communication technologies improves the efficiency of the supply chain and is therefore valuable to the company and its stakeholders. These technologies enable inter and intra-company communication and have a positive impact on the company's operational performance. These digital tools improve the responsiveness of the supply chain in a competitive environment and enable the coordination of activities between supply chain members and facilitate the efficient sharing of information (Kecek et *al*., 2019; Alderete et *al*., 2018; Yunis et *al*., 2018; Tatoglu et *al*., 2016; Zhang et *al*., 2016; Harris et *al*., 2015). The use of digital tools for sharing information throughout the supply chain increases chain efficiency by reducing costs, improving internal services, increasing visibility, reliability and traceability, and enabling rapid decision making in unexpected situations. For example, information sharing in retail companies facilitates delivery and ordering operations through increased flexibility (Shamout and Elayan, 2018; Kembro et *al*., 2017; Ali et *al*., 2017). According to Kumar et al. 2019, sharing information along the supply chain reduces the cost of inventory, enables decisions to be made at each level, and makes the company more responsive to customer needs. This exchange of information helps to maintain an intact relationship between the seller and the buyer. Indeed, the rapid exchange of information allows efficient coordination between business partners and minimizes transaction costs that can result from asymmetric information.

3.4.2 Digitalization Trends in Retail Companies

Distributors are the first players to adopt and benefit from technologies derived from digitalization (Big data, IoT, IA, social media, cloud, ...) with the aim of making the supply chain more flexible, efficient and more transparent and the point of sale more connected and closer

to the consumer to provide an original experience. Due to all these new technologies, new trends and practices are appearing in the retail sector.

3.4.2.1 Predictive Analytics

Predictive analysis is the current trend for retail companies. Indeed, the Big Data technology associated with artificial intelligence plays an important role in the decision-making process of the company. Predictive analytics means the identification of events before they happen through the use of enormous data (Kopp, 2013). In the retail sector, it consists to identify sales patterns from previous time frames by using the information contained in the Big Data to better predict and manage inventory needs and avoid key out-of-stock products in the next go-around in order to minimize the cost (Akter et *al*., 2016; Raman et *al*., 2018 and Lee 2017). The information contained in the big data led the organization to manage its demands (by predicting the need and desire´s customer), logistics, inventory, and fulfillment operation (Brajesh, 2016), enables to better demand forecasts, more efficient through the visualization and real-time tracking during shipments, and highly optimized distribution network management (House, 2014).

Predictive analysis allows data to be analyzed over time, in other words, it allows you to look back in the past to understand what happened and why it happened; in the present, it allows you to monitor what is happening now in order to predict what will happen next. The figure 11 summarizes the process of predictive analysis.

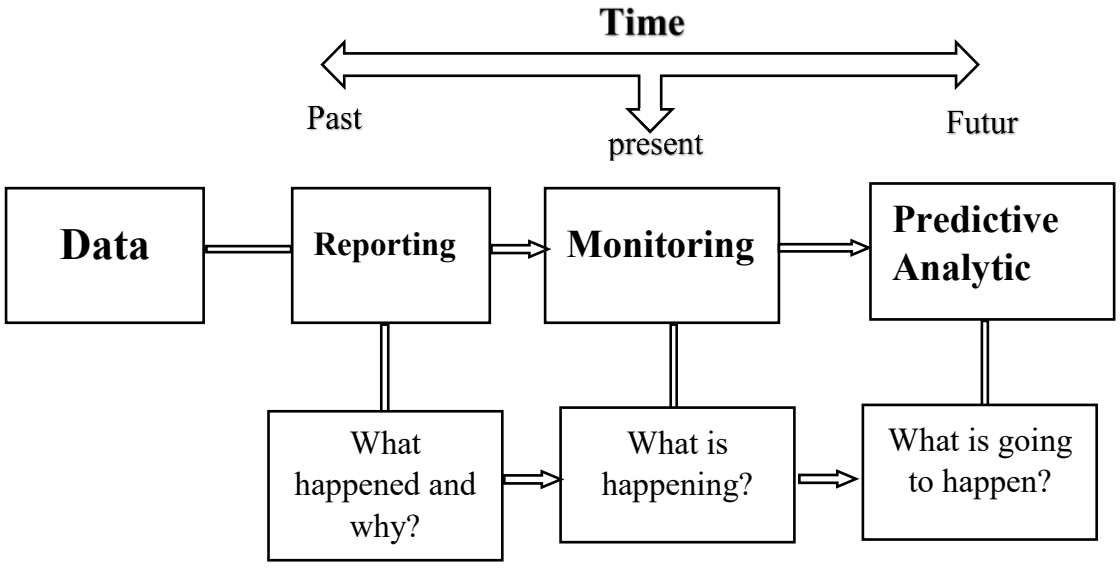


Figure 11: Predictive analysis scheme
(Source: Schrauf and Berttram, 2016)

1) Predictive Trade

Predictive trade is a practice by which a commercial offer is made to a consumer before he becomes aware of his need (Bathelot, 2016). The rise of this business is related to the phenomenon of big data and its associated techniques. Indeed, it is to deliver products to individuals before they ordered due to the information coming from the big data analysis (market baskets, shopping list, shopping card). Today, retail companies have the opportunity to analyze this data and predict a need and therefore produce a product capable of meeting this need not yet expressed. The first form of predictive trade was the recommendation of a product on the Amazon site. This company has designed this program thanks to the visits of customers on its site, the purchases made, the information sought, the desire to buy ... The analysis of this information allows us to anticipate a need and predict a product capable to satisfy this need.

Amazon applies a predictive modeling technique called collaborative filtering, using customer data to generate 'you might also want' prompts for each product bought or visited. Amazon revealed 30% of customers bought the product through its recommendation engine.

In a context of heightened competition, capturing and understanding the signals of its customers will enable a company or a brand to enter the era of a predictive supply chain, in order to act better. Listening to online consumers will help to identify the starting point of a trend and then follow its evolution in space and time. Predictive analytics will help anticipate consumer demand, plan, and quantify product volumes to visualize and optimize logistics flows.

2) Predictive Forecasting

Predictive forecasting is a key factor´s success of the retail supply chain because it uses to examine consumer behavior to better-anticipated demand, minimizing stock-outs, even during periods of unanticipated demand. (Schoenherr and Speier-Pero, 2015). With the information coming from social media, Web browsing habits, shopping lists, retailers can determine the number of products in stock and the quantity that they will probably sell in the future. They can determine exactly future demand in a specific location through customer shopping behavior in a precise geographical area.

Wal-Mart developed Retail Link, a tool that analyses the activities of every store and presents its suppliers with a view of the demand in each store so suppliers know when each store should be restocked rather than waiting for an order from Wal-Mart stores (Manyika et *al.,* 2011).

3) Cost Reduction

The analysis of the information contained in the big data makes it possible to reduce the costs by anticipation or by prediction. When analyzing the behavior of the consumer, it effectively predicts the future consumption and this makes it possible to reduce the costs related to the stock-out or the overproduction.

Indeed, in the retail sector, information from big data has contributed to a considerable reduction in costs. For example, in 2016, Tesco, a European supermarket company, analyzed refrigerator data in its supermarkets. During these analyzes, the company discovered that the refrigerators were set colder than necessary, which led to the waste of electrical energy. This discovery led the company to equip all their refrigerators with a sensor that monitors the temperature every 3 seconds. This solution was satisfactory because it allowed the company to reduce energy costs by about 25 million a year.

3.4.2.2 Omnichannel

Omnichannel is about merging channels to unify the customer experience. It's not just about offering multiple channels or making them complementary, but going one step further by providing the customer with a global, unified, seamless experience (Dupont, 2013; Keckhut et al., 2016). The services that are offered in stores are also available online, there is no difference between the channels. Indeed, the customer can carry out research on the web, inquire, and make the act of purchase in-store. The omnichannel is beneficial in terms of service and profitability. This strategy has an impact on relationship management between the customers but also with the suppliers.

There are many sales channels in retail companies, each with different characteristics. Consumers exploit the advantages of these different channels and choose the one that they believe offers the most opportunity (Harris et *al*., 2018). However, when these channels operate independently, fragmentation is created throughout the supply chain that impacts the reliability of delivery to the end consumer and consequently, the customer experience will be negatively affected (Saghiri et al., 2017). Indeed, this fragmentation is due to the lack of coordination of activities between channels because each channel operates without synchronization with the other channels. In retail sector, the omnichannel strategy overcomes these disadvantages of

multiple channels by coordinating and synchronizing activities, processes, and technologies to provide consistent, regular, and reliable service to customers (Verhoef et *al.,* 2015). The omni-channel has revolutionized the retail sector, in this strategy, the company offers products and services to consumers not through a single channel but through several channels such as the physical store, the catalog, online sales, telephone sales, mobile applications, etc.

Consumers, for their part, are becoming more demanding and are multiplying the use of different channels (Ailawadi and Farris, 2017). Consumers are gradually adopting the different channels and they can change channels at any time. For example, they may find the product through one channel (producer channel), place the order through another channel (distributor channel), and be delivered through another channel (pick-up point or home delivery) (Saghiri et al., 2017). In this way, a synergy is created between activities within the supply chain.

The channels generally used are the web desktop (pc, desktop computer), mobile web (tablet, smartphone), smartphone applications, physical trade, drive ...The combination of different channels in the buying process has increased the turnover of e-commerce in the European countries. In 7 years, it has risen from 30 billion to almost 100 billion in 2019 (Figure 12).

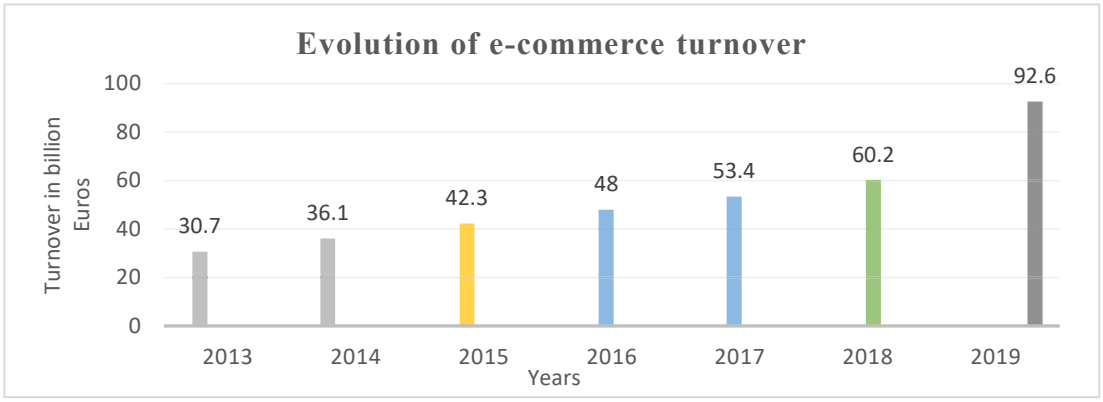


Figure 12: Evolution of E-commerce turnover
(Source: Statista.com)

The percentage of growth is over 13% between 2018 and 2019, which suggests spectacular growth in the coming years.

The use of these channels has given rise to a new form of e-commerce like m-commerce and f-commerce.

M-commerce (Mobile commerce) is the use of wireless technologies to buy a product or service. Indeed, the mobile (smartphone and tablet) is growing day by day and becomes more and more important. Since 2015, over 89% of purchases are made via a smartphone or tablet. In France, 24% of companies have their applications through which they can make purchases. From 2017, the growth of m-commerce is 38% per year.

F-commerce (Facebook commerce): refers to the realization of commercial actions online on a Facebook page. This channel represents the essence of social commerce.

In Europe, the number of online shoppers differs from country to country, but the country with the highest score is Germany with 58 million online shoppers. The following chart (Figure 13) ranks European countries according to the number of online shoppers in 2020.

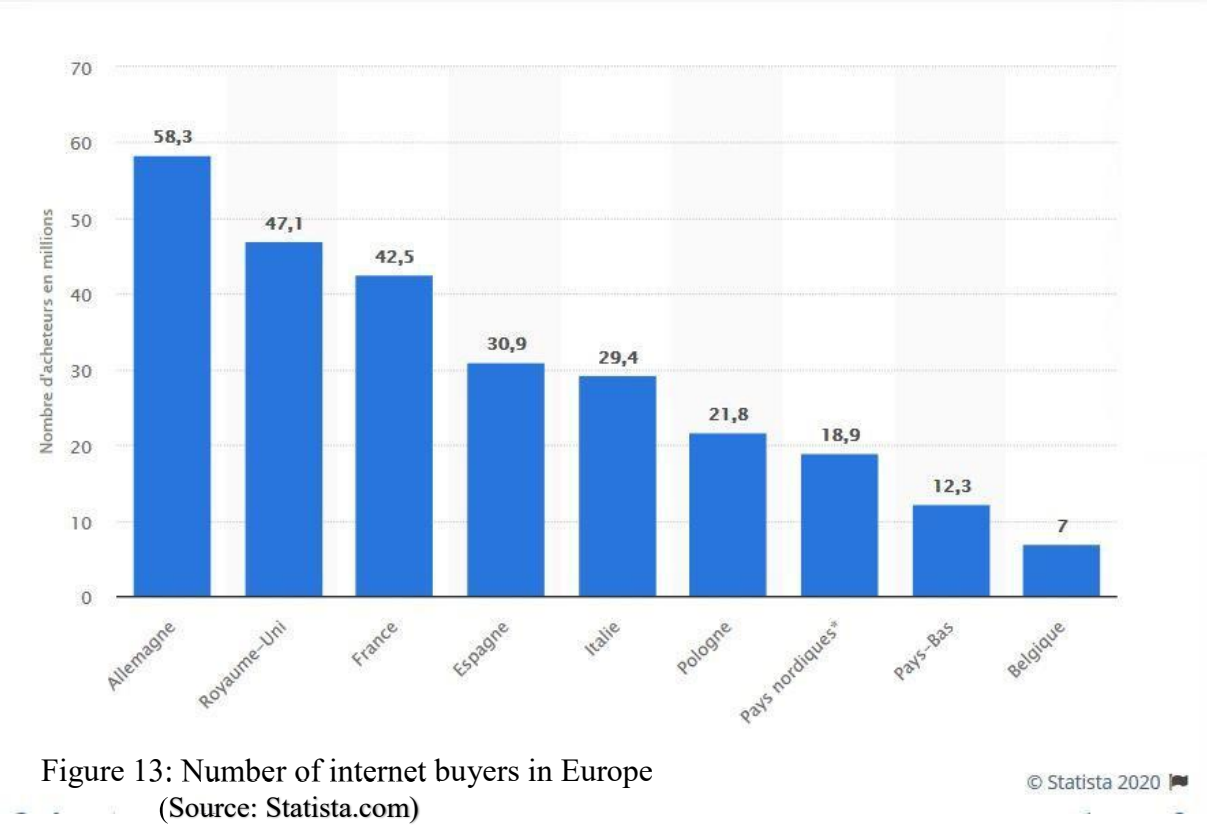


Figure 13: Number of internet buyers in Europe
(Source: Statista.com)

The omnichannel strategy can be illustrated by the following scheme (Figure 14). It shows that the customer can combine several channels to make the purchase and choose the delivery method that suits him best.

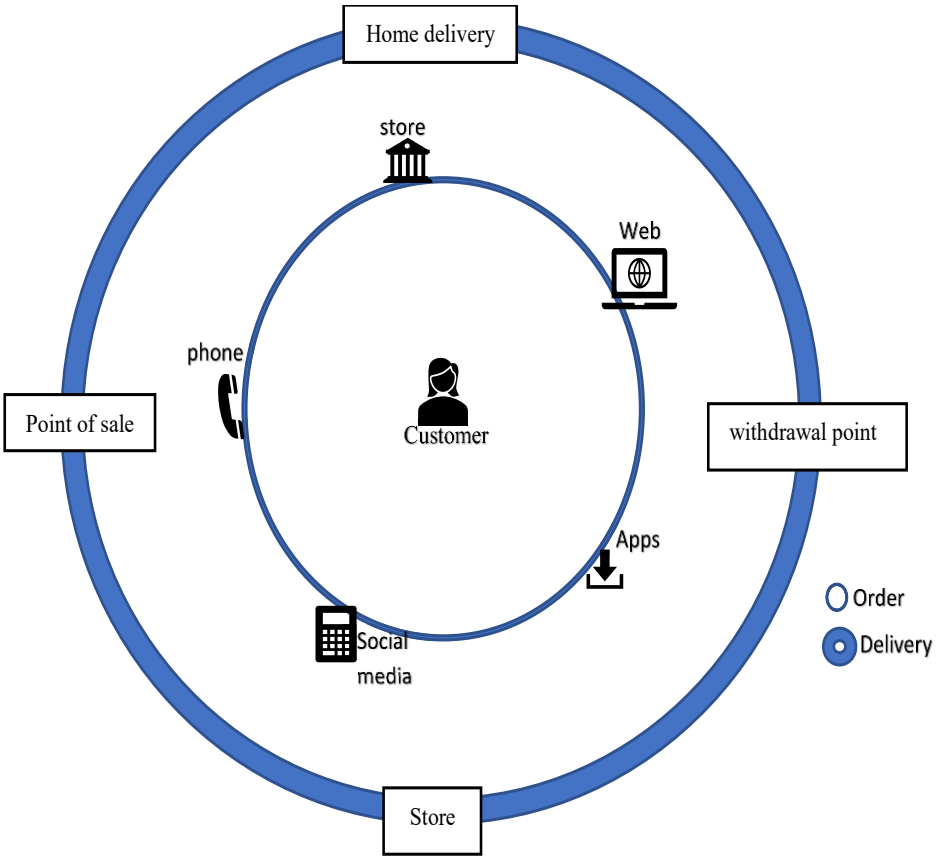


Figure 14: Omnichannel Scheme
(Source: Author´s own elaboration)

Several companies have already rolled out this strategy, among which Walmart, which offers a cash payment option that allows customers to order online and pay cash in-store. Customers who do not have a credit card are still able to make their purchases online.

Another example of an omnichannel innovation model is the British retailer Tesco, which opened a virtual grocery store in a subway station in South Korea. Travelers can shop by scanning the QR code on their smartphone from a giant digital screen displaying supermarket shelves. Once the transaction and settlement of the virtual basket have been made, the products are delivered to the user during the day.

A unique data source for all sales channels is the key to the success of this omnichannel strategy. Knowing that the supply chain is an essential part of the value chain, a single source of inventory data is an absolute necessity. The implementation omnichannel process is the redefinition of inventory management throughout the supply chain. This requires increased monitoring of inventory levels and reliable inventory deployment. The growth of omnichannel sales (web to

store) with delivery to the customer, relay point or store requires a reorganization of the supply chain in terms of storage, the level of stock and delivery times.

At the level of the warehouse, the choice of place is a success factor because it will have an impact on the delivery time. Today, it is important for large-scale retailers to increase the number of storage and order picking locations, consolidate B2B / B2C stocks, to specialize the preparation circuits, to automate processes that would allow them to easily and quickly reach a customer. In addition, warehouses must be equipped with telescopic conveyors, handling robots, scan tunnels, and packing machines. Optimization of the stock level is at the heart of supply chain management. Inventory management needs to be supported by demand planning tools for sales and operations planning, which combine forecasting methods with Big Data technologies (NTT data Business solution, 2014).

The omnichannel has disrupted the functioning of the supply chain by integrating new delivery solutions: the "click & collect".

1) "Click & Collect"

The "click & collect" is a system appreciated by customers that consist of reserving the product on the internet and sometimes without even paying and recover it in stores. This technique makes it possible to reduce the delivery costs (Keckhut et al., 2016). The "click & collect" evolve at a growing pace according to a study conducted by a British cabinet (Figure 15).

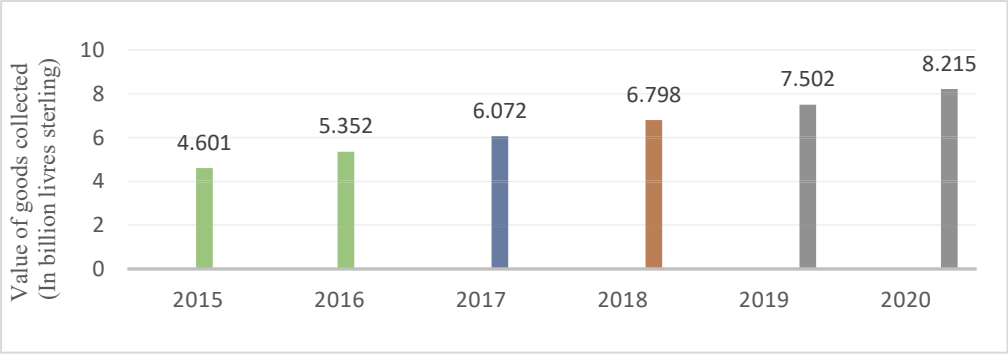


Figure 15: Click and Collect market size
(Source: Verdict.co.uk)

In the click and collect strategy, the stock of each point of sale is used. This strategy has therefore set up a drive device in order to provide solutions to the following logistics problems.

2) The Reasons for the Growth of Click and Collect

There are two main reasons which explain " click and collect" growing development (Marouseau, 2013).

Cost problems of home delivery logistics, indeed, in terms of the cost of home delivery logistics, the customer is reluctant to pay on the Internet for a service he does not consider at its fair value (including home delivery).

The second problem is that *the home delivery seems frustrating*, it concerns the availability of the customer during the hours of delivery. The customer no masters the delivery time, for that he has to adjust his schedule to the delivery schedule, which he is most likely not to respect. But with the Drive solution the customer can optimize his movements by choosing his slot of passage, for example, he can assert a withdrawal to the drive at the same time as a return home after a day of work (Mevel and Morvan, 2015).

Table 5: The characteristics of the different service drive formulas
(Source; Adapted from Mevel et Morvan, 2015)

Types of drive	Drive Pure Players	Attached Drive	Drive Store Picking
Characteristics	There is no physical store, but only the point of withdrawal	The place of withdrawal is located near the point of sale where orders are prepared	The point of withdrawal is in the store
Logistical specificities	The warehouse is autonomous. Order preparation in a dedicated warehouse	The warehouse is dedicated but "attached" to a traditional shop	Order preparation is carried out on the point of sales
Retailers	Leclerc drive Casino Express	Leclerc drive Auchan drive Carrefour drive	Le drive Intermarché Carrefour drive MescoursesCasino CourseU.com Leader drive Cora drive Simply drive

3.4.2.3 Mass Customization

Mass customization is the process by which a brand gives its customers the opportunity to personalize a product or service so that it becomes as unique as possible. Mass customization aims to deliver a customized product with near mass production efficiency (Tseng et al., 2014). The main feature is the capability to integrate the modifications on the product according to customer needs and desires. The essence of mass customization is to transform a customer into a co-designer in which the customer is able to get access to the design process by expressing the requirements or even co-designing the product through software and mobile applications (Tseng and Piller, 2003).

The standard practice of mass customization is due to the evolvement of digital technology. Today thanks to data from big data, it is possible to segment customers to offer a custom offer. The combination of Big Data, Artificial Intelligence, IoT, and Social brings two types of personalization: adaptive and collaborative.

1) Adaptive Customization

It comes in the form of a recommendation and a standard product modification form.

The first form is based on data in Big Data, such as customer purchase history. At this level, the company makes you an offer in the form of a recommendation. For example, Amazon offers its customers a personalized offer according to the subsequent purchases, and according to the products consulted on their site.

The second form is through the modification of a standard offer. Here it is a question of segmenting the market according to the data of purchase, their geographical position, the events (Christmas, new year, Easter, Valentine's day ...) and to make modifications to the products according to these periods. Several brands do it, like Coca-Cola, Ferrero Rocher, M & M'S ...

Indeed, Coca-Cola prints the names on its label, the choice of these names are made according to the zone (one chooses the most popular names in this area) or consumer profiles on social networks.

Ferrero Rocher, through its Nutella brand, offers consumers the opportunity to personalize their chocolate pot with messages containing a certain number of characters. Indeed, via the Facebook account, the net surfers can ask the labels containing the message of their choice.

The M & M's brand allows the customer to personalize their chocolates by printing their photo or personal messages on the product.

During the holidays, consumer products are becoming more and more personalized. The packaging of the products is modified at each party. For example, during Valentine's Day, a customer has the opportunity to print the love messages on Ferrero Rocher brand chocolates. Adaptive customization has developed through the rise of digital technologies (big data, social media, mobile) and the consumer becomes co-designer of the product he consumes. Indeed, it operates configurations on a standard basis.

2) Collaborative Customization

It is the most accomplished form because the product is tailor-made. The product is designed by providing the desired characteristics.

The fields in which this form is most widespread are fashion, cosmetics, and the automobile.

In the field of clothing, with the trend of digital, it is possible to design your own product. As an illustration, the website "dessinemoiunsoulier" proposes to personalize the shoes in order to create an original and unique model. Thus, the customer provides the characteristics of his future shoes such as size, color, shape, the height of the heels, materials of manufacture. The consumer can thus without moving make many simulations by the use of the tools resulting from digital technology (smartphones, tablets, 3D simulation).

In the cosmetic rays, Lancôme offers a tailor-made face powder thanks to a mini scanner to capture skin color and the production takes only 30 minutes.

The implementation of a personalization strategy is supported by the use of innovative tools and good logistics flow management which require that the supply chain should be digitized especially concerning the inventory´s management and procurement, warehousing, transport...

For that, many technologies can answer this challenge of digitalization of supply chains such as RFID technology, reality augmented, mobile devices... Among these technologies, one has been identified as a key factor´s success of customization and also disrupt deeply the supply chain: it´s a 3D printed.

3) 3D Printing

Known also as Additive manufacturing refers to the technologies that allow the production of physical goods from the ground up. The 3D printer does not require a mold, only a digital design file containing the information of the desired object (Lipson and Kurman 2013).

In the process of 3D printing, the data is the main component, because before printing the object, it is first necessary to prepare the file.

3D printing will change the dividing line between the distributor and the producer who will gradually fade. All intermediaries will disappear and stores, warehouses, and stocks will be replaced by the cloud. The customer will only buy the file from the company and have the product printed at the "print relay point" in order to obtain the final product. This technology will completely make the physical flows disappear, only the flow of information will be put forward.

In the field of clothing, Nike has already started producing some models of shoes in 3D.

In the supermarket sector, since 2014 Amazon has opened a virtual shop for objects intended for 3D printing (telephone etui, small figurines, and also jewelry). As for Carrefour, it offers its customers a unique experience by printing the customer in miniature.

Right now, 3D printing is not widely used, but when it is, and every customer can buy it, companies will no longer sell physical products but only files. At this point, the cloud will be the shop where the customers will download the files after buying them at the company.

Faced with this technological evolution, the supply chain must adapt to the adapted customization, but the most advanced modification is done with collaborative customization.

The benefits of 3D printing are follows

- Less wastage;
- Reduction of material loss;
- Reduction in supply chain risk through less outsourcing;
- Elimination of bullwhip effect;
- Elimination of safety stocks of intermediate goods;
- Customization of products;
- Lower lead times;
- Reduction in the number of parts required;
- Replacement of parts quickly and easily;

- Faster interaction of prototypes.

Despite the importance of this technology, its adoption by firms appears slower because of the following factors according to Manners-Bell and Lyon (2019):

- Fear of failure;
- Lack of available talent;
- The high cost of implementation;
- Lack of standardization of raw materials;
- Risk of counterfeiting;
- Lack of willingness of companies to take risks.

3D printing eliminates many middlemen along the supply chain, despite the many challenges that companies face in adopting 3D printing, the technology appears to have a bright future and its implementation will revolutionize many sectors.

In the case of food products, for example, 3D printing according to several authors will soon be available, food products can be programmed i.e. the pizza in 2D can be printed to reduce transport costs. The 2D pizza can be soaked in water to become a 3D pizza ready to be consumed by the final consumer at the end of the supply chain (Wehberg et *al.*, 2017; Savastano et al., 2018).

4) Impact of Mass Customization on the Supply Chain

Mass customization has changed the design production from "make-to-stock" to "made-to-order" (Tseng and Hu, 2014). Indeed, the product is only made when the purchase order is placed and this reduced significantly the inventory cost, the transport cost, and the risk of investment in the unsold product.

Reduction of inventory cost: The inventory cost is lower because the product is directly delivered to the customer after its manufacture. The quantities produced are reduced and the risks of overproduction are low. In the case of 3D printing, the product is stored in digital form in the cloud and there is no physical but virtual stock.

Low transport cost: By making it possible to produce products at the nearest or by the consumer, the company bears very little or no transport cost.

Reduction of investment risk: Manufacturing on-demand reduces the investment of the company in a large quantity production in order to avoid the unsold product.

The customization has completely changed the structure of the supply chain whether in a collaborative personalization or 3D printing as illustrated by the following schemas (figures 16,17 and 18).

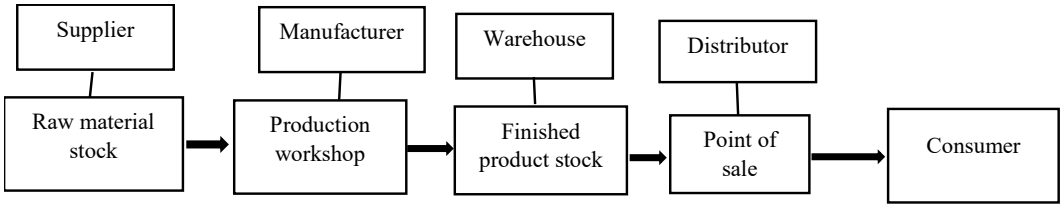


Figure 16: Standard Supply Chain
(Source: Author´s own elaboration)

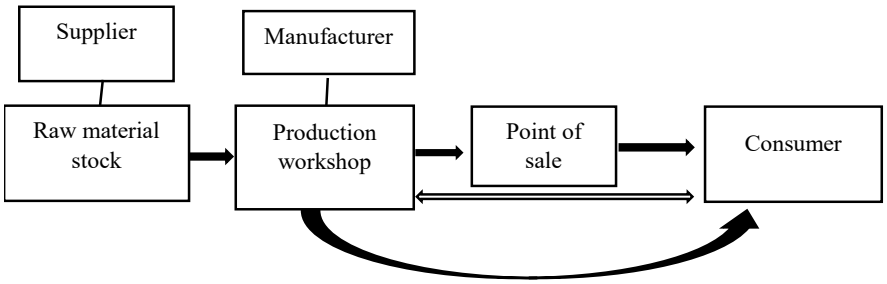


Figure 17: Collaborative customization Supply Chain
(Source: Author´s own elaboration)

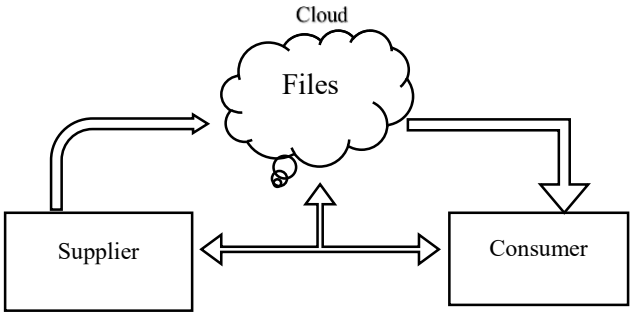


Figure 18: 3D printing Supply Chain
(Source: Author´s own elaboration)

3.4.2.4 Phygital

The term phygital refers to the association of physical to digital technology. It consists of the implementation of digital technology in the physical point of sale. It´s, in other words, the digitalization of point of sale which means the adoption of digital support within a point of sale to increase the efficiency of the point of sale (Bathelot, 2018). During the last decade, the number of digital technologies used by people has increased significantly, notably the mobile devices associated with the applications and software. Indeed, the use of these devices has an impact on retail companies. Hagberg et *al*., (2016) and Shankar (2011), note that digitalization is not restricted to online stores, but includes a number of digital technologies becoming part of shopping in fixed store, eg: digital signage, RFID or digital kiosk...Today thanks to the use of digital technologies such as big data, IoT, mobile devices, cloud, machine learning, artificial intelligence... companies have implemented many dispositive in order to facilitate the experience customer in-store. For that many technologies have been developed by the companies among which there are: geolocation by LED, web to-store, mobile payment...

1) Web to-Store

It is a technique that consists of adding a certain functionality to the brand's website or mobile application in order to provide more detail on the desired product. This technique aims to bring the customer to the store. There are some web-to-store devices put in place by retail companies such as the Store Locator and the stock locator (Keckhut et al., 2016).

The store locator is a device present on the Internet sites of the store allowing the consumer to locate the point of sale closest to him thanks to a system of geolocation of google map. It gives the details on the hours of opening and closing of the store and as well as the itinerary. These features can be found on all stores websites.

Stock Locator is a feature present on the website of retail companies allowing Internet users to know the quantities of products available in real-time in the store closest to him. It is a somewhat complex technology because it requires controlled inventory management. Inventory items must be made at any time to update the online inventory level. Today almost all the retail company is equipped with this device. As an illustration on the Amazon website, when viewing a product, it shows the quantities available in the area and indicates the time that will take the delivery. This device optimizes the level of stock to reduce the maximum delivery time. These technologies have helped in enhancing customer experience, simplify the shopping process,

and control the bull-whip effect in the supply by having a permanent control on the level of stock.

2) Geolocation by LED

It is a device that acts like GPS (global position system) and allows customers to locate the rays that interest them. indeed, Hypermarkets Casino Euralille and Galerie lafayette have implemented this technology. Thanks to the application available on the app store, customers can design their shopping list in a few clicks while including promotions, and once inside the store, the application plays the role of GPS guiding the customer to the concerned ray through the VLC (visible light communication). This device facilitates shopping in the store.

3) Digital Payment

This last decade is marked by the evolution of payment methods towards digital. These changes have been driven by the development of e-commerce and m-commerce (Raman et *al*., 2018). It is now possible to pay for a product or service through a digital wallet, applications (PayPal, bank application ...).

Payment by telephone: is done in two ways

- The first consist download the application and present the telephone at the cash desk when the payment terminals are NFC (Near Field Communication). This practice is done in most store in Europe (LIDL, ALDI, Carrefour ...) but contactless payment with NFC terminals have a limited amount.

This payment method is also done with credit cards. It is just to present the credit cards at the terminal in 3 seconds the payment is made. This method reduces the waiting line at the cash.

- The second consist to download (eg. PayPal) the application and proceed to the payment through this application in long-distance in case of online purchase.

Supermarket without cash, this results in two ways of proceeding:

The first way it involves scanning the product directly and paying it by the application. The second way consists of the customer to connect to the application through his phone, then he enters the store. Thus, the application directly detects the product when it is placed in the

customer's basket and is added directly to the "virtual basket", at the end of shopping, payment is made automatically. This technology was set up by Amazon GO and Monoprix in 2018.

Self-checkout: It is a form of express box to scan products with an RFID tag without removing the basket. you just have to put the basket filled with the product on the cash register and all the references will be displayed on the screen. The customer proceeds to the payment and takes back his basket. This solution significantly reduces the waiting time at the checkout and facilitates the process of buying the customer.

4) Multimedia Terminal

Sales assistance tool allowing the customer to consult the product in order to obtain the information sought. These terminals allow us to place the order and even to choose the delivery method.

Finally, the most successful version of point-of-sale digitalization is the creation of a cold room called "snow room" by one of Canada Goose stores in Boston. This piece is decorated with icy sculpture and is set at a temperature of -32 °. it allows customers to try a sweater under real conditions.

5) Electronic Price Tags

Indicates the replacement of prices manually displayed on paper on product shelves in retail outlets. They have been implemented by distributors to reduce labor costs, efficient inventory management, fast and efficient price changes. They have been implemented for the following reasons according to Kalyanam et *al*., 2010:

- Avoid errors when displaying prices;
- Allow customers not to confuse the prices shown on the posters;
- Facilitate price changes;
- Avoid the costs of manual exchange.

This technology is beneficial for both the company and the consumer because it allows price conformity in the store, eliminating an unpleasant exchange between the consumer and the staff within the store.

6) Digital Shelving

The digital shelving is a digital device allowing to know in real-time the stock rotation in the point of sale thanks to the frequency sensors present on the products and thus allowing to place the order automatically. Indeed, this technology allows us to have an overview and to link the stock level on the shelves of the store, in the distribution centers but also in the warehouse. The stock level is then updated in real-time. This strategy allows a good synchronization of the stock level of all stores so that in case of a product return, the product can be redirected to the store that needs it instead of being sent back to the central store. Digital shelving, thanks to its ability to synchronize all stocks, allows for efficient returns management.

3.4.2.5 Connected Supply Chain

Digital technology has considerably improved supply chain management. Several practices have been implemented thanks to digital tools. Supply chain management is more efficient through the digitalization of processes and operations. Manners-Bell and Lyon (2019) have identified several new trends in supply chain management using digital tools.

1) Product and Container Tracking

Over the last few years, many technologies have been implemented throughout the supply chain in order to be able to trace products in real-time. The tracking of containers is done thanks to GPS, which gives the position of the container in real-time. The RFID technology allows to have the complete information on the container: it allows to collect information on the whole transport route, for example, the temperature of the products and warns when the temperature is not adapted to the environment parameters, this device also warns when the door of the container is open. This type of technology makes it possible to trace the product during transport and to have information on the events that took place during the transport. Thanks to the alert system when the container is opened during transport, it allows us to prevent thefts that could occur during the transport of the goods or overloads that could be due to the fact that the drivers decided to transport other things on the way. All in all, the tracking system allows us to avoid any technical problems but also frauds.

2) Stock Optimization

Thanks to the implementation of digital technologies such as the Internet of Things, out-of-stock situations can be reduced by 80% according to Zebra technologies, because this technology improves visibility, allowing distributors to know their stock levels in real-time and thus to replenish stock as quickly as possible. According to a study conducted at Harvard Business School by Corsten and Gruen (2018), 8% of retail items are out of stock most of the time due to a lack of visibility into inventory items. Thanks to the perfect visibility and automation of activities, the order will be placed automatically when a certain stock level is reached. The visibility of the products in stock reduces the cost of out-of-stock and overstock. The McKinsey Global Institute in 2015 estimates that inventory optimization could generate savings in inventory management. This optimization can result in reductions of up to 10% per year in inventory management. This institute goes on to estimate that IoT gains are most significant in the retail sector because through the use of connected objects such as frequency sensors and cameras to monitor stock levels when the safety stock level is reached, the order is placed directly and this avoids stock-outs that could result from delivery delays. In this way, the IoT can be said to be an important decision-making tool based on real-time information. The decisions are thus taken according to the current situation and not on future forecasts.

Good visibility of the stock level allows the company to have increased control in order to decrease the stock. Indeed, the implementation of frequency sensors on products has allowed some distributors to reduce their stock in store, as an illustration, Decathlon has been able to reduce by 9% the items stored in 2014 and this has reduced costs related to inventory management (Swedberg, 2018).

3) Connected Consumer

IoT has enabled the integration of many connected objects into the everyday life of the consumer - some of these applications are not directly linked to the supply chain. However, some applications can be integrated into the supply chain such as the connected refrigerator. Using frequency sensors and video cameras, these devices can then control the contents of the refrigerator. The application can then be the ordering portal for perishable goods using these tools. When the quantities of products in the refrigerator decrease, the connected refrigerator triggers the product order especially when the product is regularly purchased by the consumer. Indeed some applications and software can learn how to reorganize items such as milk, cheese, vegetables, and thus track purchasing behavior. Moreover, the most advanced level would be to

integrate intelligent packaging that would be able to control the expiration date of products and possibly identify when the product has already expired (Manners-Bell and Lyon, 2019).

Apart from connected refrigerators, many consumers use other tools connecting the home and virtual assistance such as Alexa (virtual personal assistant that allows to perform many actions via voice assistance). According to a study conducted by Worldpay (2018), 46% of the companies interviewed said they are satisfied with these technologies because they have the ability to automatically place an order for an item without human intervention.

Digital technology has changed the consumer's buying experience, as they are no longer obliged to go to the point of sale even for products that require their presence in the place, especially clothing products. Today, thanks to 3D bodyscanners, the consumer is able to try on clothes in a virtual way through applications installed on his smartphone without having to go to the point of sale or to a fitting room to try on the garment.

Ultimately, the advent of the connected consumer and the connected home has fundamentally changed the consumer buying experience and the way the supply chain works. These technologies are very important and have dramatically improved the everyday life of the consumer on the one hand and facilitated the management and execution of activities throughout the supply chain on the other hand by enabling real-time operations management through the connectivity of all actors along the chain and synchronization of operations.

3.4.2.6 Reverse Logistics

According to the Reverse Logistics Association (2016), reverse logistics refers to the process of moving goods from their typical destination for capturing value or proper disposal. The rise of e-commerce and the introduction of phygital have accentuated the implementation of reverse logistics through two main practices: in-store recycling and the return of purchased goods.

1) In-store Recycling

In the context of preserving the environment against pollution and the search for green logistics, distributors have taken measures to protect the environment. Indeed, all food outlets are equipped with a machine that has recycling bottles in metal, plastic, and/or glass. The consumer is motivated by the gain because each recycled object earns him money.

2) The return of Purchased Items

The main consequence of e-commerce growth is the return of purchased items. This phenomenon is very common especially in the field of clothing because according to Cullinane et *al*., (2017), in Germany the rate of returns of items purchased in the field of clothing is more than 60%. For this purpose, all retail businesses having an online sales site have a rubric dedicated to returning the item with a refund or change option within a specific time, in general, it is 30 days, case of no satisfaction. At this level, the product follows the opposite way, that is, it leaves the customer to go back to the seller. These companies have therefore set up a logistics chain dedicated to the management of returns, creating warehouses for this purpose.

3.5 User Acceptance of Digitalization in Retail companies

Faced with numerous technological innovations, many authors have worked on the determinants of technology acceptance. performance expectation, effort expectation, social influence, and enabling conditions.

3.5.1 Acceptance Factors of the Retail Supply Chain Digitalization

These factors are identified on the basis of the determinants of the unified theory of acceptance and use of technologies (UTAUT).

Table 6: Acceptance factors for the digitalization of the retail supply chain

(Source: Adapted from Venkatesh et *al.,* 2003)

Performance expectation	**Effort expectation**	**Social influence**	**Enabling conditions**
- Fluidity - Rapidity - Less time delays - Avoid waste - Real time visibility	- Easy of using - Time less consuming	- Friends - Family	- Age

3.5.2 Degree of Acceptance of Digital Technologies Within Retailers

The degree of acceptance of digitalization will be analyzed according to the evolution of the use of digital tools by the companies of the retail sector.

Digital technologies have become a pressing need in the retail sector. As soon as they appeared, they were directly accepted and even became indispensable in the sector. Retailers say in a survey published by Sabanglu in 2019, that they agree on the need for a digital transformation of the retail industry. In the survey, 100% of the French companies that took part in the survey agreed on the need for a digital transformation, 90% of the German companies and 88% of the United Kingdom companies also agreed on the need for a digital transformation of retail. These high rates show that the digitalization of retail is accepted by almost all companies. These three countries represent the largest retail companies in Europe (Germany is the European leader, followed by France in the sector).

The degree of acceptance of the technology can be demonstrated through: The development of online markets in the retail sector, the growth of e-commerce users, the deployment of digital technologies in shops.

The deployment of digital technologies in shops: Indeed, the use of digital tools to improve the customer experience in shops was very quickly taken seriously by European retail companies according to a study published by Sabanglu (2019). More than three-quarters of European retailers were already using interactive digital screens inside shops (78%) and 75% were offering mobile applications to customers allowing them to make purchases and/or find out more about the shop or a particular product.

More advanced innovations have not yet been adopted but more than 30% of companies plan to adopt them in the coming years.

Augmented reality (AR) or virtual reality (VR) technologies are still taking their first steps in shops, but more than 50% of retailers are testing or will test these innovations in the coming year. It can be illustrated by the figure 19.

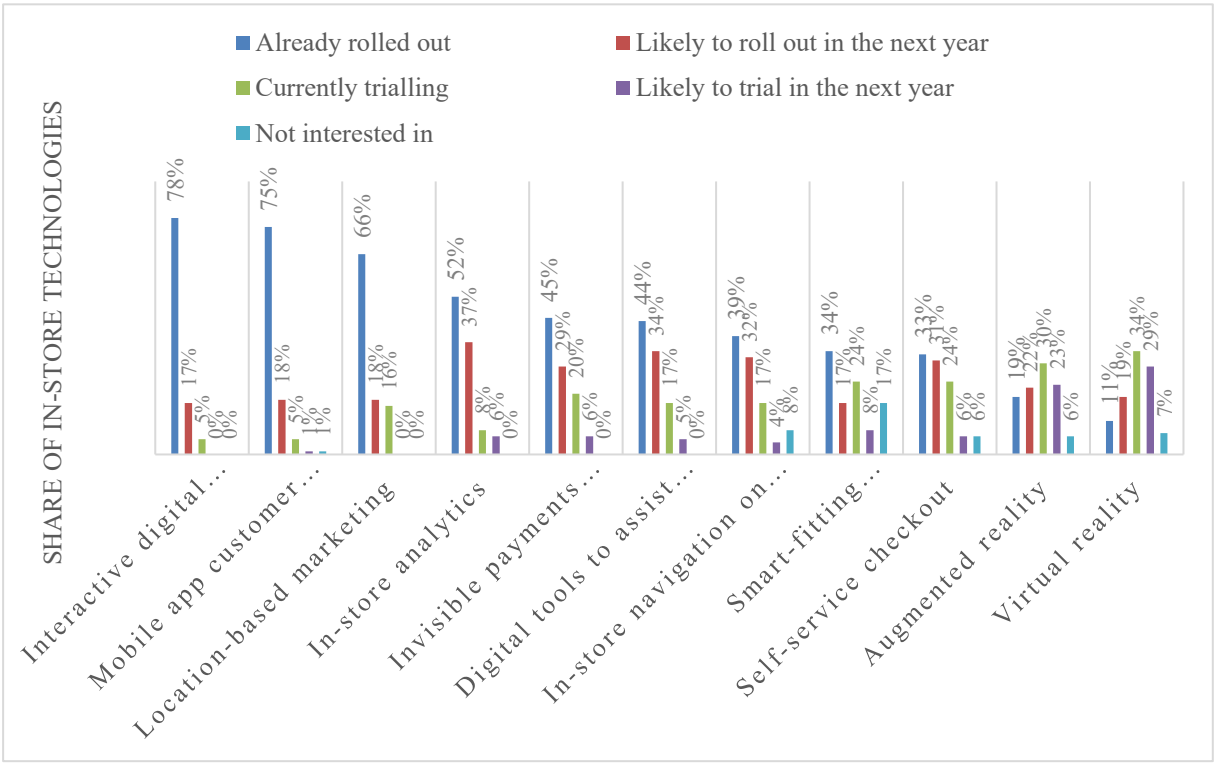


Figure 19: The deployment of digital technologies in shops

(Source(s): WBR Insights; Retail Connections; ID 1026229, www.statistica.com) **Note:** Europe; 1st quarter 2019; 100 Respondents; Directors of commerce)

On the consumer side, 81% are very interested in the interactive digital signage because this device allows them to have the information quickly inside the shop; 80% of the consumers use the applications made available to them by the distributors in order to consult the products before making the purchase.

Given the high number of companies that have already implemented digitally in their shops or are considering doing so in the near future, it can be said that digital technology is accepted and appreciated by companies in the sector.

The growth of e-commerce users: The number of e-commerce users has grown enormously across Europe, from 394.8 million users in 2017 to 479.7 million in 2020. This implies that users have accepted this channel. This growth will not stop at this level according to the statistics made by statistica (Figure 20), the number could go up to 554.2 million in 2024. By analysing these statistics, it can be noticed that since 2017, e-commerce users are on the rise and it could mean that, this technology is accepted and will continue to be accepted by users.

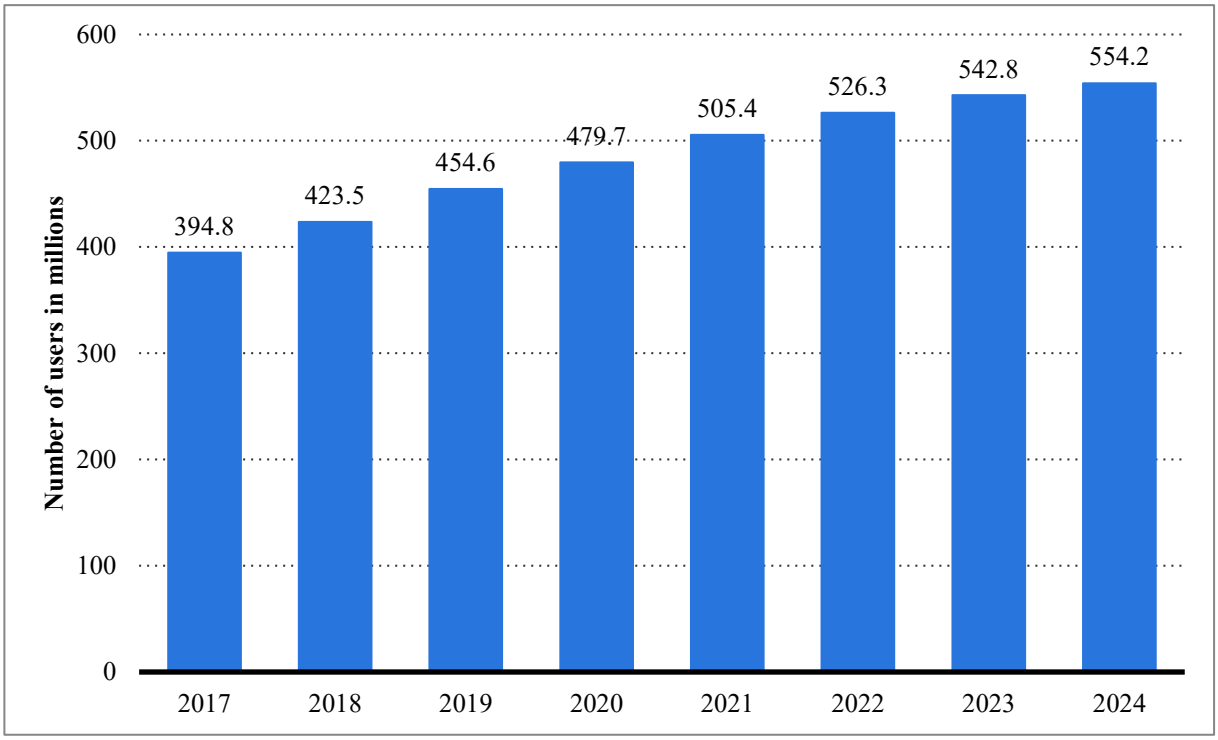


Figure 20: The growth of e-commerce users
(Source(s): Statista; ID 715683, www.statistica.com)

Digital technology is more used by consumers in the 25-44 age group. This age group was revealed by studies conducted by statistica in 2019 in three different countries: The United States, Germany, and France (see Appendix 4). This can be explained by the fact that these users are quite young and for most of them it is at this age that they start their professional life and therefore they are very busy and are looking to save time and therefore they are more willing to research a product through an application or a website and make a purchase online without wasting time due to travel to the point of sale. they are also attracted by their ease of use because in one click the purchase can be made.

In short, as digitalization in the retail sector is accepted and used by consumers and businesses, its success in the supply chain depends on a number of factors.

3.6 Example of Retail Companies Digitalization Best Practices

In order to illustrate the successful practice of digitalization, Walmart and Tesco have been chosen.

Walmart

The world's leading retailer has transformed itself from a traditional retail company into a technology and innovation company, a phrase used by CEO Doug McMillan to describe Walmart. The company has successfully deployed transformation strategies in all aspects of its business processes, such as shelf inventory, supply chain management, delivery, online space, and has optimized the overall customer experience.

Indeed, in the procurement process, Walmart has designed the IRL (Intelligent Retail Lab) to collect information on what is happening inside the shop thanks to an impressive array of sensors, cameras and processors. The first aspect they focus on is inventory and product availability. That is to say, they use all kinds of sensors to obtain real-time information and inform associates to know more precisely when to restock products and more. This technology ensures that the customer is assured of the presence of the product in the shops.

The use of RFID chips has enabled this company to reduce their out-of-stocks by 30%, reducing inventory errors by 16% and returns by 22%, as well as preparation errors (Ustundag and Tanyas, 2009).

In 2017 the company launched robotics in 50 of its shops and was expanded to 350 shops in 2020. These are shelf scanning robots. The robot has the task of palletizing, depalletizing, sorting and preparing the products in the shops. It scans the product shelves to check out-of-stocks, misclassified products, bad labelling and also collects data for subsequent analysis. In short, they automate the process of scanning stock in the shelves so that when customers enter the shop, they always get what they are looking for.

The company is currently testing electric shelf labels that will automatically adjust prices according to the direction of the shop. They even want to go one step further by implementing real-time adjustment of the pricing strategy, where the electric shelf labels not only communicate with other technologies in the shop and warehouse but also integrate third-party data.

Tesco

Tesco has opened a virtual grocery shop in a South Korean metro station, where users do their shopping by scanning QR codes using their smartphones.

A large wall-mounted display panel was installed in the station, depicting a series of supermarket shelves and displaying images and product prices. Each panel also includes a QR code.

Users scan the code of all the products they wish to purchase, forming their online shopping basket. Once the online payment is made, the products are delivered to the user's home within hours.

https://www.toxel.com/wp-content/uploads/2011/07/virtualstore06.jpg

This strategy makes productive use of waiting time in supermarkets while saving time for buyers to get to the point of sale.

The company is in the process of implementing a technology that will make it possible to scan customers faces to design a personalised advertisement for each individual.

3.7 Success Factors of Digitalization

The performance of a digital supply chain is measured by the ability to execute the request at all times, meet deadlines, improve the reliability of the chain, and reduce costs as well as lead times. Despite these advantages of digitalization throughout the supply chain, only a few companies have adopted the process of total integration of their supply chain, as some have started to digitize only part of their processes at the moment, not total digitalization of the supply chain. According to a survey conducted in 2016 by Schrauf and Bettram on 2000 respondents, more than a third of these respondents have started to implement digitalization along their supply chain and more than 72% of the respondents expect full supply chain digitalization within the

next 5 years. The reason why the implementation of the fully digitized supply chain is slow according to Büyüközkan and Göçer (2018) is the lack of awareness of the importance of digitalization by workers, stakeholders, and the lack of adequate skills in the use of digital tools. For successful digitalization of the supply chain, several authors and research firms have proposed to put in place certain elements. Thus, the implementation of a digital supply chain depends on the following key success factors.

3.7.1 Automation

Digitalization allows to increase productivity through the implementation of various working methods and the use of machines and software, for this it requires automation of processes, because, with technological innovations, the automation of processes, the use of self-vehicles and as well as robots, and the automated management of warehouses, goods can be transported with minimum time from one point to another.

Automated systems allow avoiding management errors subject to manual management that would slow down the execution of tasks and consequently supply chain inefficiency. Automated execution, i.e. flawless human-machine interaction, increases the operational efficiency of the company (Kersten W. et *al*., 2017; Schmidt et *al*., 2015).

3.7.2 Collaboration and Information Exchange

Collaboration is a key factor in successful digitalization. Indeed, working together with one or more partners allows the company to improve its competitiveness on the market. In addition, the pooling of resources and skills is essential not only between the partners in the supply chain (Vertical) but also with other actors present in the company's environment such as university and associations.

Concerning collaboration with universities, the latter support and promotes knowledge useful to companies. To consolidate this collaboration, research institutes have been set up in universities to carry out research oriented towards the creation and implementation of new technologies and often industrial research requested by companies in order to propose innovative solutions. This partnership is most often in the field of production and management of the logistics system and very often in the research of methods and techniques for the application of

information and communication technologies throughout the supply chain (Hines, 2004; Accenture, 2014; CapGemini, 2016).

The successful implementation of digitalization requires a permanent dialogue between the various employees. In order to achieve good collaboration, it is essential for the company to harmonize data for concerted decision-making. For this purpose, a study conducted by Agena3000 proposes to adopt an S&OP process (Sales and Operations Planning) in order to achieve optimal company performance. Indeed, it is an aspect of supply chain planning whose ultimate goal is the implementation of a single business plan agreed upon by all stakeholders. The decisions that are taken in this type of process impact the entire company. Even if the supply chain manager is the conductor, the presence of the other players in the company is necessarily required for a decision to be taken. The implementation of this process necessarily requires the collection of data but also the sharing of data with the various employees in order to make effective decisions.

To this end, collaboration should be an overriding goal for all stakeholders. This is how the S&OP process comes into its own; it is a collaborative and decision-making tool that aims to establish an agreement between the objectives of the different departments and those of the company.

Collaboration between the different actors of the supply chain allows transparency in the different processes and actions carried out. Thus, it is important to have global visibility common to all members in order to achieve the objectives set and to identify possible obstacles that may exist. In order to make the most of digitalization within the supply chain, it is therefore essential to promote collaboration in order to improve decision-making based on the exploitation of available data to be agile and reactive in an environment characterized by exacerbated competition. A high level of efficiency is only achieved when employees are aware of the impact of their input on the entire supply chain. Ultimately, the digitalization of the supply chain requires good collaboration between all the players in the chain.

Information exchange: The exchange of information in the supply chain is of crucial importance. Smooth communication throughout the supply chain reduces costs and increases efficiency. Information exchanges in retail companies, in particular, allow sales forecasting and better stock management. In the retail sector, because customer loyalty is fundamental, these companies use information exchanged on social media platforms to build loyalty (Hines, 2004; Cecere, 2014).

In addition to these factors, a study conducted by the McKinsey consulting and strategy firm identified several other factors for a successful digital transformation.

3.7.3 Ambitious Vision

Having an ambitious vision implies that leadership must have a strong involvement in digital transformation. Indeed, in organizations, leaders need to set up a body responsible for implementing all possible strategies in order to make the digital transformation success. Moreover, this body must enable the implementation of the various possible strategies, coordinate the various actions necessary for the digital transformation, have access to enormous financial resources to acquire the technology necessary for the digital transformation and, above all, human resources that can implement these technologies in all the company's business lines. This vision must also be disseminated throughout the organization.

3.7.4 Proximity to the Customer

Companies should start thinking in terms of customer needs. Whether in B2B or B2C the customer is the same. For example, there should not be a big gap between delivery times when it comes to a particular customer (retail) or a business customer (wholesale). Indeed, being close to these customers allows us to apprehend interactions, identify trends and expectations in order to propose a solution that works. In order to reduce the large gap that exists between B2B and B2C order processing, it is important to simultaneously implement digital levers such as Data Analytics, which will allow us to predict the demand of retail customers but also of wholesale buyers in order to provide them with almost the same level of service; Machine Learning, Artificial Intelligence will enable automate processes and therefore less time-consuming. The deployment of these digital levers can generate between 5 to 10% additional revenue (McKinsey, 2018). This increase in revenue makes companies aware of the value that digital can bring them.

3.7.5 Competences

Finding skills in the digital field allows extrapolating in a structured way the needs of a company in terms of qualification. The digitalization of the supply chain requires skills in reactivity in the event of errors such as agility, positive error management, a willingness to experiment

and innovate and an interdisciplinary approach, but also skills in the use of new technologies, the ability to analyze large data sets and the use of new means of communication.

In the retail sector, the skills required are the ability to analyze data and master information and communication technologies. Indeed, data analysis skills improve the decision-making process, increase understanding and forecasting of the demand, and allow to solve identified problems and even anticipate possible problems throughout the supply chain.

These skills are necessary because you must always be aware of your environment through the data collected and know how to decode them in order to anticipate the needs and reactions of customers that affect the functioning of the supply chain.

As for mastering the use of information and communication technologies, the competence required is the ability to learn and adapt quickly to technological innovation, given that technology is evolving day by day (CapGemini, 2016; Kersten et *al*., 2017; Hines, 2004).

The implementation of digitalization requires skills in this area. To this end, companies must recruit the best profiles in terms of digital skills. The success of the digital transformation inevitably depends on competent people capable of using digital tools without the slightest difficulty. These people must be able to adapt as quickly as possible to any changes in the environment that may occur, they must have a good capacity to learn new knowledge and be able to apply it as quickly as possible and in the right way.

This consultancy believes that having the skills is not enough, these digital talents must also be protected. This protection implies that each talent recruited must do what it is recruited to do. Indeed, a talent must do the job for which it was recruited, otherwise, it risks abandoning its position because its current assignment is not what it masters best or it does not value its skills enough. Moreover, a study conducted by the McKinsey firm shows that 250,000 data scientists would be needed to meet the demand from companies. However, once these people are hired, more than half of them are assigned to data cleaning and data architecture, yet these tasks are not the purpose for which they were recruited. This situation will push the majority of them to give up and the recruitment issue will once again come to the fore. This is why it is necessary to protect one's talents and to give due consideration to the talents for which they have been recruited.

3.7.6 Implementation of the Test & Learn Culture

The test & learn culture is for the company to change the mentality of its employees. This implies not being afraid to fail, test & learn allows employees to test their ideas, to follow their own path even if they fail, and then start again. This strategy allows employees to learn from their mistakes. It is necessary to go beyond the time when many studies have to be done before starting a project, test & learn allows to test ideas instantly to adopt the idea if it works, if not to identify their mistakes in order to correct them, this perspective allows to avoid wasting time in the different test phases. This culture assumes that "if we have to fail, let's fail quickly". Nevertheless, it is not easy to establish this culture, because employees are used to applying ideas that have already been tested after a lot of studies, whereas testing & learning pushes them to take their own initiative and go their own way in order to innovate. The company should also encourage employees even when they fail so that they do not become discouraged. The implementation of digital technology requires that employees have a lot of knowledge in the field for effective use. Since these tools are new, the best way to gain knowledge about their use is to test new practices in order to innovate on how to use and exploit them in the most effective way.

3.7.7 Physical Infrastructures

In addition to the technology, and the people capable of using this technology, digitalization requires the physical infrastructure to be in good condition. This infrastructure refers to the state of the roads and the quality of the internet network allowing for the efficient use of the technologies.

Road Infrastructure: The success of supply chain digitalization depends on the road conditions. Indeed, roads in good condition play a crucial role in facilitating the movement of people, goods, and services and in reducing the overall cost of logistics and trade overheads. Quality infrastructure also reduces production costs, provides access to raw materials, and opens up previously inaccessible areas. They increase the efficiency of the supply chain by significantly reducing delivery times. At the regional level, quality road infrastructure also promotes cross-border trade, provides better access to major regional markets, and promotes regional integration. The importance of good quality road infrastructure is more obvious when it comes to trade

between neighboring countries because road transport will be less expensive than air or sea transport for freight transport.

The quality of transport infrastructure affects the functioning of the supply chain in two ways. First, poor quality infrastructure increases transport costs by increasing direct transport costs and delivery times. Secondly, transport infrastructure affects the quality of products, a poor state of infrastructure increases the chances of deterioration of transported goods.

Internet network: The Internet network is the means by which all computers around the world are connected and therefore constitute the decisive factor in the digital revolution. The Internet is essential for the implementation of digitalization. The digital transformation of a company requires above all a high-speed internet connection. Indeed, the waiting time for loading a page must be instantaneous. The success of digitization depends on the availability of a good internet connection. Coordination and the ability to react depends on the speed at which the information is transmitted. Especially in the retail sector in industrialized countries, everything depends on information and communication technologies associated with a high-speed Internet connection.

Despite the importance and effectiveness of digitalization within the supply chain, there are nevertheless challenges facing companies in the retail sector in particular.

3.8 Challenges of Digitalization in Retail Companies

Companies that have embraced digital technology have had a lot of success, but besides this success, they are facing more and more challenges. In the retail sector, the main challenges faced by these companies include the gradual disappearance of the physical point of sale for non-food products, the issue of data security in the face of cyber-attacks, and respect for privacy in the use of customer data. Digitalization exposes the company to the risk of losing control of the data. Indeed, data that was previously stored on internal servers are now stored in the cloud, so it becomes vulnerable in case of failure and is exposed to the risk of cyber hacking.

3.8.1 Decline of Physical Stores

The physical stores tend to disappear little by little. This disappearance is due to the growth of e-commerce. This phase of decline first began with the reduction of the sales area. Indeed, 2011

Casino has reduced its sales area by more than 20%. Next comes Carrefour's in-store reference reduction phase. Physical stores are now more concentrated in food products, as the majority of non-food products are purchased through e-commerce. There is a dramatic 50% drop in physical store attendance. Faced with the rise of e-commerce giant retail has partnered with Google to market hundreds of thousands of products online. In 2016 this company closed more than 300 stores.

In May 2019, Carrefour announced the abolition of 3,000 employee positions in non-food items. In addition, it has been shown that 62% of consumers consider that shopping in supermarkets is a corvee.

3.8.2 Cyber Risk for Retailers

With the evolution of technology, customer data and financial information are invaluable to cybercriminals. Retail firms are hacker´s prime targets, while consumer confidence is paramount and is conditioned by the level of security of the most financial data they manage. Indeed, the current trend is to digitalization, customers are more and more connected, autonomous, and mobile. This trend is leading companies to collect tons of customer data to improve their experiences. This data can include names, addresses, credit card information, and more. This information makes retailers prime targets for hackers.

The protection of these data is a major issue for these companies, but it is increasingly difficult with the evolution of technology and companies are increasingly facing the attacks of cybercriminals. In fact, the world leader in the retail sector Walmart suffered a huge cyber-attack in 2013, during which more than 40 million bank cards were pirated and 70 million personal data were stolen. This attack cost $ 1 billion to the retail giant. The fight against cyber-attack is a major issue in the supermarket sector because customers need maximum security in order to trust the companies.

Attacks in this sector persist because according to the retail edition of the 2018 Thales Data Threat Report, half of all US retail companies have reported being breached in 2017. To deal with situation measures were taken in matters of regulation. Retail companies that do business in Europe must now comply with the EU General Data Protection Regulation (GDPR) since May 2018. A similar law is also been put in the US.

3.8.3 Respect for Private Life

The question of respect for private life is recurrent in the era of digitalization. Companies are increasingly faced with the dilemma between respecting the private lives of consumers and the willingness to anticipate and predict the consumer's need. In fact, companies collect data from social networks, purchase histories, bank data, etc. Moreover, these data come under the private life of consumers. It has shown that 73% of consumers do not want to share their personal information (LSA, Commerce connected).

To ensure that these companies respect the privacy of these consumers, Laws are being enacted in the US for example, the California Consumer Privacy Act of 2018, takes effect in 2020, will confer consumers the right to know how their data is used, to decide not to have their personal information resold by companies and finally to have their data deleted by businesses.

This regulatory measure put in place by the government is a major challenge for retail companies because it reduces the field of data exploitation by these companies indeed it is the customer who decides on the use of his information.

3.8.4 Dehumanization

Digitalization has transformed everything in companies, replacing human and manual data processing with computer and automatic processing. Computers and other digital technologies are no longer just tools but have become operators. Therefore, it can be noticed that what man does the machine do better than him and in less time. Robots have replaced humans and therefore reduce jobs and increase the unemployment rate. Digitalization will also cause enormous upheavals in employment because a lot of work will become automated and as a result, many jobs will be lost and this will increase the unemployment rate.

Ultimately, digitalization has profoundly changed the way companies operate, especially in terms of their supply chain. In fact, it has introduced many trends in the retail sector in particular, and companies have also understood that its successful implementation depends on several factors. In spite of its proven effectiveness and the improvement of supply chain performance, its adoption generates a certain number of challenges that these companies try to meet on a daily basis.

3.9 Conclusion and Summary of the Chapter

The aim of this chapter is to study the phenomenon of digitalization within the supply chain in general and that of retail in particular. The literature has been used in order to give a definition of digitalization according to the context of the study and it has been concluded that digitalization is considered as the use of digital tools in the performance of tasks. Thus, the result of the literature review in the field of digitalization reveals that digitalization is based on four main technologies: Big Data, Cloud, IoT and Social media. In addition, other technologies such as robotics, artificial intelligence and machine learning are also used. It also appears that the application of these technologies in the supply chain has given rise to new trends.

For example, the use of Big Data has enabled companies to perform predictive analysis to predict future demand and customise offers for different occasions; IoT and other technologies have transformed the physical point of sale into a digital one with many changes that facilitate the customer's experience at the point of sale. On the other hand, digitalization is widely appreciated in the developed countries, there is a growing use of different technologies, but also the appearance of new ones. It also emerged that the successful implementation of these new technologies required several factors. These factors include the physical infrastructure, technologies, the implementation of a digital culture within the internal and external environment of the company.

However, in the face of the positive spin-offs, companies and other users also face some challenges related to digitalization among which are privacy, dehumanization, the gradual disappearance of physical shops and therefore some jobs. Nevertheless, despite the apparent challenges that businesses will face, digitalization remains beneficial and contributes to the improvement of business performance.

Chapter 4: Analysis and Evaluation of Retail Supply Chains in Cameroon

In the majority of African countries in general, the retail sector is in an embryonic stage, accounting for less than 5% of retail trade compared to 60 to 80% in the industrialized countries in the 2000s. In Africa and more particularly in Cameroon the sector is dominated by informal practices. In fact, the most important distribution channels are the traditional markets as well as the small neighborhood shops and street vendors. This is explained by the low level of infrastructure development that does not allow retail trade to develop in a competitive manner (Bahri-Damon, 2017). However, this sector grew by more than 6.8% per year between 2002 and 2007, following a study conducted by the firm Performance Management Consulting.

In African countries, the retail sector is being structured. The development of this sector differs from country to country. In 2012, Nigeria, considered to be Africa's leading economic power, had only 2 shopping centers, unlike South Africa, the second-largest economy in Africa with almost 100 shopping centers. This situation can be explained by insecurity and terrorism in some countries.

Moreover, in West Africa, the increase in the opening of shopping centers is strong because, from 2014 to 2015, the growth rate was 19%. According to the Sagaci consultancy firm, between 2015 and 2017, there were 34 new shopping centers. The growth of the sector will continue. In Central Africa, there are few actors and the sector is not very developed. However, since 2016 CFAO (French company of accidental Africa) has entered the sector. In March 2016, it announced a future investment of 500 million dollars for the construction of 20 shopping centers in Africa, notably Cameroon, Gabon, DRC, Senegal; Ghana, and Cote d'Ivoire.

In Cameroon more specifically, the retail sector is moving towards stiff competition with the arrival of super U on the local market at the end of the year 2017. Cameroon thus became an essential commercial ground and a privileged market. The French leader and number 7 worldwide retail, Carrefour opened in Douala and plans to open six shopping centers in Cameroon by 2022, with the opening of an average shopping Center in Yaoundé. This points to strong changes in the sector (Brice, 2017).

4.1 Presentation of Retail Sector in Cameroon

The retail sector in Cameroon has long been dominated by the presence of street vendors, neighborhood shops, and traditional markets. With the arrival of the new modern forms (supermarket, hypermarket...) in the sector, new trends have been created in the sector.

4.1.1 Forms of Retail Trade Dominant in Cameroon

Traditional forms of retailing have long dominated the retail sector. These forms are as follows.

4.1.1.1 “Boutiques” or Neighborhood Shops

Is a geocultural approach to small neighborhood businesses called "boutiques" (Plantin, 2013). These shops are characterized by the presence of a salesman in a small sales area behind a counter. These points of sale are located close to their customers, often 5m from the consumer's home.

The supply chain is structured in such a way that the seller obtains supplies from wholesalers who sell to him at wholesale prices. Replenishment quantities are low and margins are also low. His supplier is usually a shop larger than him and sells at a price for which he will have a margin when he details the product. The supply chain is short because there is no middleman between the supplier and the customer (shop), he (the shopkeeper) goes to the supplier (wholesaler) himself, makes his purchase and transports it back to his point of sale, the wholesaler is usually not far from the customer's point of sale because the customer does not choose the one that is too far away in order to reduce transport costs. The point of sale can also be delivered by traders working on behalf of the supplier.

4.1.1.2 Traditional Markets

Are characterized by the presence of several sellers (exhibitors). In Cameroon, there are markets in every city in the country. Some are daily (Mokolo, Mboppi, small central market.....), indeed every day they are open from sunrise to sunset. In these markets there are several exhibitors of products, some in covered areas and others in free air, and also itinerant sellers. The market is

subdivided according to product categories. For this purpose, a distinction is made between the vegetable market, the fish market, the meat market, the clothing market, and the footwear market, in short, as many product categories as there are sectors. And others are weekly (marché de Dang, marché de Bamyanga…), there is a day dedicated to the opening of these markets, the sellers come from different neighborhoods, markets, and villages. Customers from different districts also come to buy the products, because in these markets the products are generally cheaper because the market is only open once a week and those who come to sell all their products at low prices, especially the villagers.

In this market there are retailers as well as wholesalers. Retailers in this market supply from wholesalers in the same market.

Wholesalers, on the other hand, are supplied by local suppliers and are delivered directly.

Products such as fruit and vegetables come directly from the farmers who come to sell directly the products from their fields. The products are transported in public transport vehicles (bus or taxi) at the same time as the seller. The supply chain is direct or with a single intermediary.

These two forms of distribution channel of products dominated the retail sector in Cameroon. However, the last two decades have seen the emergence of modern supermarkets (supermarkets, supermarkets, hypermarkets, and shopping centers).

4.1.1.3 Modern Distribution Channels in Cameroon

The retail sector in Cameroon has undergone numerous changes with the arrival of international companies. First, it has been noticed the creation of supermarkets by Cameroonian economic operators and then thanks to the 2013 law in favor of private investment granting 5 years of exemption and customs clearance to any company investing in Cameroon, several foreign companies, particularly French ones, have seized the opportunity to set up in the major cities of Cameroon.

The arrival of these companies began in 2015 with the opening of a hypermarket of the French super U chain and then followed with the opening of Carrefour in 2017. The foreign retail companies present in Cameroon are mainly established in the southern part of Cameroon, more precisely in the central region (Yaoundé) and in the coastal region (Douala).

In the retail sector, the sales outlets, in general, are located in the periphery but the Cameroonian one is not. The majority of them are located in the city center. This location is certainly more

accessible for consumers, but from the point of view of the organization of logistics there are some difficulties. For example, the difficulty of the car park which creates traffic jams. The parking space in the city center is generally small, which means that visitors to the outlets sometimes park in front of the outlet, creating traffic jams and making access to the outlet more complicated.

The solution to making the traffic around these points of sale easy is to install these points of sale on the outskirts where there will be a very large parking space. However, this solution also has limitations because many customers are not prepared to make a long journey to make purchases as there are other traditional vendors nearby. The point of sale will then become selective, i.e. only people with a vehicle will be able to go there.

The presence of these companies only in Yaounde and Douala can be explained by the following reasons:

- The presence of ports near to these cities that facilitates imports of foreign products;
- The poor state of the roads leading to other cities;
- The problem of insecurity in some areas of the country.

The table 7 shows a retails companies present in Cameroon as well as their country of origin

Table 7: The retails companies present in Cameroun

	Companies	Origin
National	Dovv, Bell achat, Santa Lucia, Fokou, Nziko, Niki	Camerounian
Foreigners	Casino	French
	Carrefour	French
	Leader price	French Hard discount
	Mahima	Indian
	Spar	Netherlands
	Super U	French

It appears that the retail sector in Cameroon is characterized by a Franco-Cameroonian battle. The sector is highly competitive; thus, it includes the Mahima Indians, the international Mercury group against the French (Casino, Super U, Carrefour), and the nationals (Dovv, San-ta Lucia, Bel Achat...). The constant arrival of these powers can be explained by:

- The growth of the retail sector in Cameroon;

- The presence of ports in the country that facilitates imports of foreign products;
- The stability of the currency (euro/franc) allows us to avoid exchange rate risk;
- Tax and customs exemption for foreign investors in Cameroon;
- Low competition from nationals in the sector.

To face this tough competition, national operators adopt the strategy of diversifying the offer because, in addition to the sale of mass consumption products, these brands (Dovv and Santa Lucia) include bakeries, fast food, and Snack Bar.

4.1.2 New Trends in the Retail Sector in Cameroon

With the arrival of many competitors in the retail sector, many practices have been set up to differentiate themselves from others and get more out of them.

4.1.2.1 The Breakthrough of “Made in Cameroon” in the Shelves of Supermarkets

The very high agro-pastoral potential of Cameroon leads to the referencing of products made in Cameroon in the points of sale. Indeed, the Cameroonian government has set itself the objective of promoting the selling of products grown and/or processed in Cameroon in sales areas. These products are gradually gaining space on the shelves of supermarkets, as they are in high demand by expatriates who appreciate them. In supermarket shelves, for example, the local agro-industry is gradually gaining ground. Pasta, cookies, plantain chips, peanuts in various forms, and even cassava croquettes are available. Some products such as "penja pepper" and coffee have an international reputation (Avomo, 2017). Economic patriotism seems to be invading Cameroonian consumers because they say*:"... I only buy a foreign product if there is no equivalent in Cameroon..."*. The following words are from a supermarket manager in Yaoundé and testify to the consumer's enthusiasm for Cameroonian-made products: "Cameroonian products are in great demand".

The French Supermarket casino finds satisfaction in the sales of products made in Cameroon. Indeed, since 2015, it has been possible to find in the Casino Yaoundé supermarket, cassava sticks commonly known as "bobolos"; "mitoumba", a kind of cassava cake; "cous-cous de maïs"; or "taro", etc. All well-conditioned. A person in charge of this point of sale points out that the bulk of the customers are members of the diaspora or parents wishing to send packages

to family members or friends living in certain metropolitan areas of the country or in Western countries. However, the prices of these local products are slightly higher at Casino than those charged in the streets of the country where they are abundant.

4.1.2.2 Hot Prepared Meals Shelf

The awareness of retail companies that the majority of its customers are people with jobs and therefore do not have enough time, and the desire to satisfy customers who want more and more their lunch break, like eating at home, led them to set up shelves of cooked and hot dishes ready for immediate consumption so that when leaving the workplace, they go to the point of sale to buy their lunch or have dinner before going back to work or going home Fongang, (2018).

The offer of these hot dishes is more and more varied for example Santa Lucia places at the disposal of these customers 30 ordinary dishes a day in its shelves of cooked dishes. The price of these cooked dishes is very affordable because with 500f cfa it is possible to have a hot dish.

4.1.2.3 Cash and Carry Strategy

It is a format practiced mainly in the context of B2b, which consists of wholesale and low-cost sales (Sinha and Kar, 2010). This strategy targets businessmen and large families who make large quantities of purchases. This strategy has been practiced by several supermarket giants (Walmart, Metro...). This strategy is practiced by Casino through the opening of a brand in Douala in 2018. This point of sale has been a success since its opening, this success can be explained by the fact that the city of Douala is an important economic pole of Cameroon because there are also several businessmen who stock up in this point of sale to resell in the districts, in addition to being one of the most populated cities in the country.

As a result, there are many small businesses such as small restaurants in the districts, shops, these customers buy a large quantity and for this reason, the retail companies have set up the cash and carry to meet the needs of this clientele who only buy for their own consumption because they resell after transformation (these restaurants) or in retail without transformation (the district shops). This strategy enables them to earn a profit margin due to the fact that they buy at wholesale prices.

The objective of this strategy is to cover the market by allowing people who cannot go to the point of sale of these businesses to purchase the desired product and to allow the traders to be competitive.

4.1.2.4 Arrival of E-commerce

According to the 2018 report of the United Nations Conference on Trade and Development (UNCTAD), Cameroon is ranked 10th in e-commerce. Indeed, the Cameroonian e-commerce sector has experienced strong growth in recent years, thanks to numerous investments in the country, multinationals, the ever-increasing number of online buyers, the level of server security, and ease of payment. The craze of Africans for smartphones and the rise of mobile payment are the factors that have encouraged the development of online sales. It is noted that nearly 30% of Cameroonians use the Internet. This growing use of the Internet has therefore encouraged the development of online sales of various items since 2013 with the opening of several sites. These are sometimes the agencies of large international or pan-African groups. This is the case for "Jumia Markets".

Jumia Market presents itself as a vast shopping mall where almost everything is sold. Household appliances and technology (smartphones, mobile phones, televisions, tablets, computers). Clothing (clothing, shoes, watches, bags), beauty products (oils, perfumes, make-up), decorative objects for the home (dishes, household products, furniture), etc. In addition to this pan-African company, there is "Wandashop", one of the first Cameroonian e-commerce sites created in 2013 by a young Cameroonian woman.

Wandashop offers more cultural goods (CDs, DVDs, books), drinks (wine, Whisky, cognac). While "Kerawa", launched in 2008, offers real estate, land, hight-tech products, and automobiles for sale. Both e-commerce and classified ads sites, it also offers rental offers.

The most popular products on the Internet are electronic devices (telephones, tablets, computers, followed by household appliances), fashion, and beauty products. The populations of Douala, Yaoundé, and Maroua have been identified as those who have made more purchases online.

The multiplication of these online sales sites is the consequence of the ease of payment because there are at least three methods of payment made available to customers by the sites installed in Cameroon:

- Payment by credit card,

- Payment by mobile money.

Despite this rise in the importance of e-commerce in Cameroon, there are nevertheless many challenges to be faced.

- The cultural challenge " The first obstacle to the development of e-commerce is cultural. Africans, in general, are more reassured when they hold their money in their hands, touch and feel the product and come directly into its possession. “Paying online and waiting for delivery scares some people," says an online sales manager;
- Low access to electrical energy;
- The cost of internet access considered expensive by e-commerce sites.

These trends are not practiced by all retail companies in Cameroon. Certainly, all the points of sale present, have the same main activity (retail sales), their ways of management are different. In fact, the difference is observed in the points of sale, especially in the product shelves (regular presence of products in good condition). Some points of sale reveal efficient management and others a less efficient one. The differences observed at the level of the point of sale are the result of the supply chain management of these companies, that´s why the study focuses on the retail supply chains in Cameroon by choosing some companies in order to determine the origin of the differences observed in the points of sale.

4.2 Characterising Cameroon Using Comparative PESTEL Analysis

The PESTEL analysis consists of studying the macroeconomic elements that can influence an organization. It is composed of six factors: Political, Economic, Socio-cultural, Technological, Environmental and Legal.

These factors are likely to influence the company from the outside. The PESTEL analysis in this research (Table 8) focuses on factors external to the company that have an impact on the process of digitalization of these companies.

Table 8: Comparison through PESTEL analysis

Elements	European context	Cameroonian context
Political	- Lower electronic communication tariffs and the abolition of roaming charges on 14 June 2017 (roaming at national rates)[1]; - Free internet access points (hotspots) for citizens and visitors in public places across Europe, as part of the WiFi4EU[2] scheme; - Broadband Connectivity Fund for Europe (for digital network infrastructure); - Funding possibility provided for the period 2021-2027 under the new regulation (Connecting Europe Facility) (Passau, 2020).	- Strategic Plan for the development of the Digital Economy, called "Digital Cameroon 2020"[3]. - The National Digital Council had planned to increase the contribution of digital technology to Cameroon's Gross Domestic Product (GDP) from 5% in 2016 to 10% in 2020. - It was planned to increase from 6% to 20% the percentage of households with access to the Internet.
Economic	- Maximizing the growth potential of the digital economy - The growth of e-commerce, - Search for productivity improvement,	- The proliferation of SMEs with little access to information, - The growth of the retail sector
Socio-cultural	- Open-minded users who are always ready to accept new technology, - Confidence in new technologies,	- Reluctance towards the use of new technologies by the population, - Lack of confidence in new technologies,
Technological	- High % of mobile technology user, - Broadband Internet	- low % of mobile technology users - Low internet speed - Proliferation of social networks user

[1] Joint Declaration of 14 June 2017 by the Maltese Presidency of the Council of the European Union, the European Parliament and the Commission. http://europa.eu/rapid/press-release_STATEMENT-17-1590_fr.htm

[2] Adopted by the Council on 9 October 2017: http://www.consilium.europa.eu/fr/press/press-releases/2017/10/09-free-wifii4eu-internet-hotspots/

[3] Vivement un Conseil national du numérique au Cameroun ! http://www.vivement-un-Conseil-national-du numérique-au-cameroun!–digitalbusinessafrica/

	- The evolution of digital infrastructures (The creation of the big data in the various fields of AI, Blockchain technologies, Cloud computing, Development of machine learning, Popularisation of mobile technologies (smartphones and tablets), IoT).	- Almost non-existent digital infrastructure
Environmental	- Good communication infrastructure - Political stability.	- The poor state of communication infrastructure - The high rate of corruption, - Political instability (Boko Haram and the Anglophone crisis)
Legal	- General data protection regulations; - Implementation of an online dispute resolution platform[4]; - Legislation on privacy (Directive 2009/136/EC) and data protection (Directive 95/46/EC)[5]; - Legislation on geographical blocking, which limits direct and indirect discrimination based on the nationality, place of residence or place of establishment of consumers in transnational commercial transactions between professionals and customers in the European Union;	- Adoption of the law on cybersecurity and cybercrime

[4] http://ec.europa.eu/consumers/odr/
[5] Règlement (UE) n° 526/2013

4.2.1 Comments

When looking at the comparison table, it appears that in the European context all factors are favorable to digitalization. On the political side, the government is putting in place all the means to facilitate the digitalization process, providing financial and even technological resources. The economic environment is favorable and even the population is open to new technology. This can be explained by the fact that several laws are adopted to protect the users of these digital technologies. In short, all the elements are there for successful digitalization, which is why companies based in Europe are more advanced in the digitalization process.

However, in sub-Saharan Africa in general and Cameroon in particular, external factors do not allow the company to evolve rapidly in its digitalization process. The economic factors are favorable to digitalization and also on the political level. However, the political proposals made are more theoretical than practical. There are good strategic plans, but the realization of these plans is not effective.

As far as social factors are concerned, the users are reluctant to use them because there are not enough legal means to protect them in the event of an inconvenience and therefore they prefer not to use them at all. As far as technology is concerned, the infrastructures facilitating digitalization are in very low presence. For example, the percentage of people with a computer is between 4 and 12%, unlike in Europe, where the percentage is between 25 and 49% for some countries and between 49 and 89% for others (Figure 21), by United Nations Global development, Goals indicators.

4.2.2 Result: Technological gap/ Digital Divide

The technological aspect is a real challenge in the digitalization process in Cameroon. Indeed, even when technological tools exist, their potential is not effectively exploited. Computers and other technological tools are only used in their primary function, i.e. transforming paper documents into digital documents and doing simple calculations. Moreover, even the technological coverage is very low in African countries in general and in Cameroon in particular as illustrated by the digital divide. Indeed, this low percentage of computer users may be due to the fact that many do not know how to use them because it is recently that computer courses have been introduced in all secondary schools and has become a compulsory test in these schools.

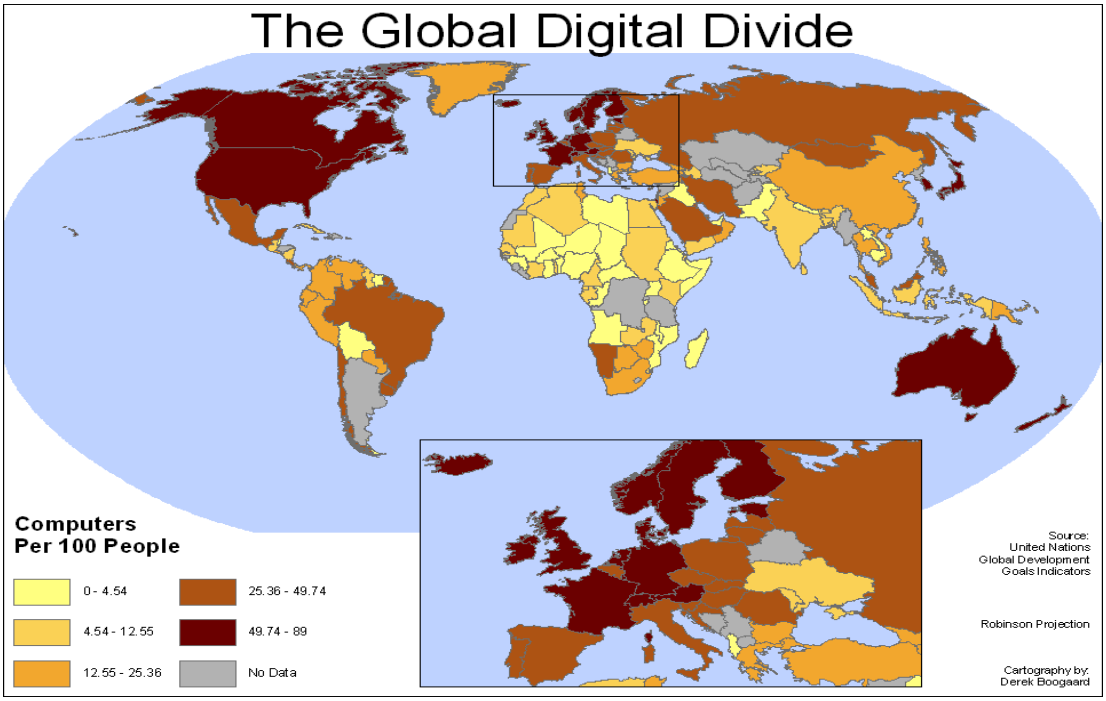


Figure 21: Digital Divide
(Source: United Nations Global Development Goals Indicators, https://bgdd.org/)

Given that the use of computers is the first step in the digitalization process, the Cameroon situation reveals that the country is far from being ready in its digitalization process because even a quarter of the population does not yet own a computer, this clearly explains the delay in the process of business digitalization implemented in Cameroon.

4.3 Description and Analysis of Retails Supply Chains Based on Case Studies

The supply chain is a network between the company and its suppliers in order to produce and distribute the product to the final consumer. The purpose of the supply chain is to put the product in the right place, at the right time, in the right quantity, at the right price, and in the right condition. In short, the supply chain is based on the 5R. For its success, it requires the coordination of not only physical and financial flows but above all the flow of information. It involves several more players from the supplier to the end consumer. Nowadays, faced with the opening

up of markets on an international level, the supply chain has also become more international and consequently longer and more complex to manage for companies in general and those in the retail sector, as they manage hundreds of thousands of products.

The cases studied concern two categories of companies: on the one hand, foreign retail companies implemented in Cameroon and, on the other hand, totally Cameroonian companies. This study focused on six companies of which three are national and the other three are foreign.

The table 9 presents the selected cases in detail as well as the details of the interviews conducted in order to obtain the necessary information.

Table 9: Details about the companies interviewed

Cases	Type of point of sale	Origin	Informant	Interview duration
A	Hypermarket	French	Supply and sales administration manager	5 days of intership
B	Supermarket	Netherlands	Procurement manager	2 interviews: 1h and 20min
C	Supermarket	French	Purchasing Manager	2 interviews: 45 min and 25 min
X	Supermarket	Cameroonian	Responsible supply chain	1h
Y	Supermarket	Cameroonian	Purchasing Manager	1h
Z	Hypermarket	Cameroonian	Managing director	3 days of intership
6 intervening companies including 3 Cameroonian cases and 3 foreign cases				

4.3.1 Cases Descriptions of Foreign Companies

The aim in each case is to describe the process of sourcing imported products, then the information exchange system throughout the supply chain in order to identify the technologies used to manage the information flows and finally to identify the next step in the use of technologies in the management of information flows within the supply chain.

Company A

In this company, the study has been carried out through the observation of the different processes from these observations and the questions asked, the following information has been obtained

Supply process

The supply process for imported products is triggered when the safety stock is reached. As soon as the safety stock is reached, the company analyses the sales trend for the period, as it may indeed be a period when the demand for the product is high or not, depending on this analysis, the company draws up a proforma invoice including the quantities it needs when the quantities are defined, it sends its order to the central purchasing office located in the parent company's country of origin (France, Spain or India) which will organize the purchase of the products by cross-docking. Once the order has been prepared, the products are loaded onto a means of transport which is either a boat (the most commonly used means) or an aircraft (not often used). Products transported by air are fresh products that are difficult to preserve, such as fresh cheese and yogurt.

Orders for products from abroad are placed once a month. Determining the optimal quantity ordered is of the utmost importance because the delivery time is very long, as between the moment the company located in Douala, for example, places its order with the central purchasing office in France and the moment it receives its order, a period of 16 weeks elapses.

This time is distributed as follows: the transport time between the port of departure and the port of arrival takes an average of 4 weeks, the administrative procedure at the port of arrival takes an average of 8 weeks and the remaining 4 weeks are devoted to the preparation of the order by the central purchasing office.

As far as local purchases are concerned, the purchasing process is carried out by each point of sale according to its needs. When the point of sale identifies its needs products, it draws up the purchase order that it sends to the local supplier. Ordering local products is done on average twice a week, but it depends on the product, but the majority of local products have a high stock rotation. As soon as the order form is sent, the delivery time is on average 3 days. This delivery is made easier because the producers/suppliers are on-site and most of them have their own delivery vehicle. After delivery, the company proceeds directly to the payment of the invoice.

In this process, deadlines are still not met and there are often out-of-stock situations at the points of sale.

Transport

The transport of products from the port of departure to the port of arrival is carried out by forwarding agents who organize the transport of these goods by sea. When the product reaches the port and all the administrative procedures are carried out, the transport process for the delivery of the goods to the shops is started. The transport between the port and the shop is carried out by the companies specialized in the transport of goods because the company does not have a goods transport vehicle and therefore has signed a transport subcontracting contract with the said companies.

Information system and exchange

This company has an Enterprise Resource Planning system, which is a management information system that gives the decision-maker better readability of activity flows and a much more accurate simulation capacity (Rowe, 1999). This system integrates the Advanced Planning and Scheduling (APS) software, which, depending on the demand expressed downstream of the company, APS makes it possible to analyze the capacity of the company's resources and constraints in order to propose a detailed and adaptable plan for optimal replenishment.

Within this supply chain, information between external partners is exchanged mainly by email. Telephone calls are also used to follow up on orders that have already been sent and the WhatsApp application is also used to ensure that the order has arrived and is in good condition. This is done by sending product photos taken by the receiver that prove that the product has arrived without any after-effects.

As for the information exchanged between employees, there is a digital platform called "share point" which allows information to be exchanged on the smooth running of activities throughout the supply chain.

The digitalization of information flows within this company began with the use of barcodes to ensure product traceability, to identify the product, and to facilitate its inventory. To this end, all products marketed in this company have a barcode to identify them. This barcode requirement is not difficult to comply with by foreign suppliers as all their products already have a barcode. However, for small local suppliers, this is a real concern because they do not have enough means to computerize their system and allow each product to have a barcode according to international standards allowing it to be identified. To compensate for this deficit and allow these small suppliers to be referenced in their shops, the company has created GS1 Cameroon

training workshops that allow these suppliers to learn how to create bar codes specific to each product at a lower cost. Although these bar codes are not recognized according to international standards, they at least allow the product to be assigned an identifier. This initiative is beneficial for the supplier because his product will be referenced in the department shops and it also facilitates activities such as inventory, the quick passage at the checkout on the retailer's side.

This digitalization continues with the implementation of digital payment, in fact, the customer can pay with his credit card at the cash desk of the company's points of sale. According to company A, the use of digital tools has enabled them to save time, improve the reliability of operations and reduce costs (thanks to the digital sending of data, which avoids costs if the documents were sent by post or DHL), empower employees and save a lot of time for analysis in order to make effective decisions. On the customer side, they are satisfied with the fact that they can find the products almost all the time on the shelves thanks to a computerized system that updates the stock in real-time and therefore there are few out-of-stock situations and the quick checkout due to the fast scanning of the products and the card payment that saves them time. Faced with the efficiency of this digitalization, there are nevertheless constraints linked to the environment such as the problem of internet connection which persists in the Cameroonian context which often does not allow the use of these digital tools and there is also the poor state of the roads throughout the Cameroonian territory which makes the delivery operation very difficult and which sometimes prolongs the delivery time.

In addition to these environmental difficulties, the company faces the complexity of cold chain management. In fact, there is no system for controlling the temperature of fresh products during transport and it is impossible to know whether the products have been kept at an adequate temperature throughout their transport. Furthermore, there are few employees who are familiar with the use of certain software and applications because they do not have enough experience in their use, but also, some of them are hooked on traditional technology to carry out transactions throughout the supply chain. Indeed, this new technology requires reactivity and good coordination and therefore everyone has to work instantaneously so that the process continues without interruption. This way of working instantaneously puts pressure on employees who used to work in their own way characterized by a postponement of tasks.

This company plans to extend digitalization throughout the supply chain by automating the whole system, it also plans to open shops in all the regions of Cameroon in the future years.

The table 10 provides a summary of the case study.

Table 10: Characteristics of company A

Case	Information system and exchange	Negotiations	Digital technology	Next step of digitalization
Company A	- ERP system - Share point - Email - WhatsApp	- Negotiation with Central purchasing; - Negotiation with the freight forwarder for maritime transport; - Transport outsourcing for road and railway transportation	- Optical barcode reader; - Digital payment; - Social media.	Automation of the supply chain by implementing the EDI system

Company B

In this company, the interview was conducted with the Procurement manager within the company and the following information emerged.

The supply process

It is triggered as soon as the company has reached its safety stock. For this purpose, it has an ERP system with which it determines the quantities to be purchased. Once these quantities have been determined, a purchase order is drawn up and sent to the central purchasing department for imported products. In this case, the circuit is indirect because it is the central purchasing office that is in direct contact with the suppliers. After receiving the order, the central purchasing office prepares the order and then sends it by air (fresh products such as yogurt and fresh cheese, which do not withstand long periods of transport), and by sea, for the others product. The delivery time is less than 24 hours when the products are transported by air. However, this period is longer when the goods are transported by sea. Indeed, the quantities transported by sea are greater than those transported by air and the mode of transport is also slow. Therefore, the delivery time is between 16 and 18 weeks.

As far as local products are concerned, the circuit is direct because it is the point of sale itself that is in direct contact with local suppliers in order to obtain supplies. Indeed, each point of sale evaluates its needs and launches its order with the supplier and it is then delivered within a maximum of 3 days.

Transport

The transport of the ordered goods is carried out by a subcontractor in the case of imported products. When the goods arrive at the Autonomous Port of Douala, the company signs a transport contract with a transport company in order to transport the goods to the company's warehouse in the city of Douala. The merchandise destined for Yaoundé is then transported in turn. The transport is subcontracted because the company does not have delivery vehicles. The transport company has to decide whether to use multimodal transport (rail and road) or only road transport to bring the product to the city of Yaoundé.

As for local suppliers, they deliver the products to the company with their own delivery vehicle. Each point of sale receives the product directly.

Information system and exchange

The company has implemented the ERP system to effectively manage its operations throughout the supply chain. The company uses VMI (Vendor Management Inventory) software to determine the replenishment quantity. This software uses previous consumption data to determine the new quantity to be ordered. As far as traceability is concerned, the delivery vehicles are equipped with GPS and the company can access this GPS data to determine the exact position of the vehicle in order to estimate the time of arrival of the goods. However, the estimated arrival times based on GPS data are still not respected because of environmental hazards, as this manager states *"... we cannot entirely rely on GPS data to estimate the arrival of goods, you know..., transport vehicles are confronted with numerous obstacles such as traffic accidents, bad road conditions, and moreover beeuuhh ... you yourself know the traffic jams especially on the Douala-Yaoundé axis, ... at Yassa level let's not talk about it then..."*

In addition, the exchange of information with external partners is only done by e-mail. Documents such as purchase orders, delivery notes, and invoices are mainly sent by e-mail for procurement abroad. However, for local suppliers, these documents are sent in paper form. Even if they have already been sent by e-mail, a paper version is also required to formalize the operation. Formality is very important for this company, according to the words of the respondent*:*

"you always need proof documents, here, papers are very important, uh... a simple e-mail is not enough when it is a question of money, you always need a physical document". Within the company, employees exchange information via a group WhatsApp creates each department or service within its group for this purpose and they communicate information about the activities of this department. In addition, there is a group that includes all departments, and in this group only the heads of the departments/services that are present in that group.

As for the management of the point of sale, each checkout is equipped with an optical code reader to facilitate the work of the cashiers and inventory management. This company does not sell products that do not have a bar code and therefore offers training workshops to local suppliers in order to create for each product a bar code that is recognized at least at the national level (same strategy as Company A). In fact, the stock level is automatically readjusted after a product has passed through the checkout and therefore avoids stock shortages as much as possible thanks to the maintenance of an updated stock level in real-time. This technology also allows customers to save time thanks to a quick checkout and a regular presence of products on the shelves due to the transmission of real-time information on stock levels. In addition to barcode scanners, the company's points of sale have implemented digital payment devices that give customers the opportunity to pay by credit card. However, digital payment is not accepted by customers due to a lack of trust. In fact, less than 5% of customers entering the point of sale pay by credit card, as they are not willing to expose their banking data (data considered too sensitive), so they prefer to pay by cash, which is considered more secure.

The level of acceptance of the ERP system within the supply chain is also low, especially among employees. On the one hand, the employees reject the system, claiming that the system puts a lot of pressure on them in the way they work - they always have to act in real-time. Because, according to them, the task is always carried out on the spot, not postponed, they even go further and say: "With this system, you can't even breathe...", and on the other hand, many don't know how to use certain sophisticated software and others have difficulty fitting in and using the new technologies (especially the older ones). As an illustration, some employees say that the mobile phone is only made for making calls, for them, it is not possible to use new applications and social networks. However, despite their effectiveness, the use of these technologies comes up against certain constraints regardless of the company, such as the poor state of the road, the instability of electricity throughout Cameroon, and also the poor internet connection.

Future perspectives

In the years to come, the company plans to automate their information system by implementing EDI, encourage customers to adopt digital payment, set up the online sales site, develop web to store to enable customers to discover the point of sale before they arrive in order to reduce traffic at the points of sale, especially at peak times. The strategic decision in the coming years is to open several points of sale in several regions of the country.

Table 11: Characteristics of company B

Case	Information system and exchange	Negotiations	Digital technology	Next step of digitalization
Company B	- ERP system - Share point - Email - WhatsApp	- Negotiation with Central purchasing; - Negotiation with the freight forwarder for maritime transport; - Transport outsourcing for road and railway transportation	- Optical bar-code reader; - Digital payment; - Social media.	- Automation of the supply chain by implementing the EDI system; - Implementing the Web to store; - Developing E-commerce.

Company C

The interview in this company was carried out through a phone call to the Purchasing Manager.

Supply process

The process of sourcing imported products in this company is done according to the following steps:

The first stage consists of the establishment of requirements that can be done when the safety stock is reached. This is done during the inventory, as there is no system that automatically

signals when the safety stock is reached. Then the company determines the quantity be ordered after analyzing the market situation, which considers the fluctuations in demand for the product on the market.

The second step is to contact a foreign supplier. This step consists of negotiating the price of the product with the supplier by sending him the pre-order so that he can draw up an estimate with all possible discounts.

The third stage is the sending of the final order with the payment of the invoice. As for the supplier, he prepares the customer's order in order to make it available to the forwarder so that he can transport the product to the final destination.

In the case of this company, the forwarder is commissioned by the company itself and not by the supplier. This forwarder is in charge of organizing the maritime transport of the goods so that they can reach the port of Douala in Cameroon. Once the goods arrive at the port, the same forwarder takes care of the land or rail transport to the company's warehouse.

The average time between the placing of the order and receipt is 16 weeks. This time is divided between the placing of the order, the sea journey, and the administrative procedures at the port of arrival.

In the case of this company, it does not have a central purchasing office responsible for organizing the purchase of all products abroad, so the procedure is the same for each product.

As far as local products are concerned, the procedure is almost the same as for company A, i.e. each point of sale sends its own order according to its needs to local suppliers and receives its order in its own point of sale and even the delivery times are the same (on average 3 days).

Information system and exchange

During these processes, information is exchanged by email through the sending of purchase orders, pre-order, and even the invoice; by phone call and also by WhatsApp. These tools are used to exchange information whether they are external partners or even between employees within the company.

In order to facilitate stock management, cash management, inventory, and to save time in activities, this company does not reference any product that is not equipped with a barcode allowing it to be identified.

The use of these digital tools (such as applications and software) has allowed employees to be more autonomous because they no longer have to wait for orders to come from the highest

hierarchy, they can decide at their level based on the information they have, except for strategic decisions. In fact, information is shared regularly and instantaneously. However, the use of these tools is not without difficulties due to problems related to the physical infrastructure.

Future perspectives

Despite these infrastructure shortcomings, the company is considering the creation of online sales sites, the extension of physical shops in several regions of Cameroon, and the automation of their system for real-time management of operations within the supply chain.

Table 12: Characteristics of company C

Case	Information system and exchange	Negotiations	Digital technology	Next step of digitalization
Company C	- Calculation and commercial management software - Email - Physical documents	- Negotiation with suppliers; - Negotiation with the freight forwarder for maritime transport and for road and railway transportation	- Optical barcode reader; - Social media.	- Automation of the supply chain;

4.3.2 Cases descriptions of Cameroonians companies

This section describes the supply chain of Cameroonian retail companies.

Company X

The interview in this company was conducted with the company's Supply chain Responsible. It took place by telephone and lasted one hour.

Procurement process

In this company, the process of sourcing imported products is carried out as follows:

The first step is the identification of needs. In fact, each department manager notes the absence of products on the shelves, and then he approaches the storekeeper to find out if the product is available in stock when the storekeeper informs him that the product is in low quantity or has

reached the safety stock, the department manager approaches the purchasing manager to express the need for the product. The purchasing manager assesses the market situation to determine the quantities to be ordered. The second step is to place the order with the supplier. The order is placed by email by scanning the order form and sending it.

The next step is the quotation request, which consists of asking the forwarder or carrier for the overall cost of importing the goods. The freight forwarder will make an estimate based on the mode of transport, the place of departure and arrival, the nature of the goods (which may require a particular mode of transport), and the quantity. Once this estimate has been made, the company confirms its order, and the goods are then shipped to their destination. The goods usually take the sea route to arrive at the autonomous port of Douala so that the administrative procedures can be carried out. The time between placing the order and receipt is 16 weeks on average with all procedures included. Between the port and the company's warehouse, transport is subcontracted, as the company does not have a transport vehicle.

As soon as the company receives the goods, it checks the sell limited date (S.L.D.) on the packaging of the products. This check is done manually. This date indicates the time limit beyond which the product cannot be consumed, after verification, the company confirms the SLD charge which stipulates that the products are not expired. After receiving the goods, the company also receives the invoice. The last step is the payment of the invoice by bank transfer.

As for local products, the supply is done as follows: after establishing the need, the company draws up a purchase order, sends it to the supplier and the latter delivers the goods to the company. The delivery time is very short (2 to 3 days). Delivery is made using the supplier's delivery vehicles.

In this company, the supply scheme is very fragmented as it is in direct contact with all its suppliers and the delivery flows directly from the supplier's warehouse to the distributor's shops.

This supply process faces many difficulties, the consequences of which can be seen even in the points of sale, with stock shortages due to late deliveries. In addition to the delays in deliveries, the company faces difficulties in the management of fresh products, especially during transport. In fact, the conservation of fresh products is very delicate, and therefore it is necessary to keep a permanent follow-up. For this reason, during the transport of these products, the company has no means of checking the temperature at which the goods have been kept.

Information system and exchange

Information is exchanged through phone calls, emails, or mobile applications between the actors of the supply chain.

The information system is managed by classic calculation and invoicing software (sage sari and Excel). This software is in charge of carrying out the calculations related to stock management, i.e. entries into the shop; exits for shelf placement, products available on the shelf, etc. in short, all the information necessary for the proper management of the supply chain. However, this information is entered into the machine manually; there is no automated system that would allow the information to be entered automatically. The use of these information exchange tools covers all the operations of the supply chain, i.e. from the placing of the order to the point of sale.

In the points of sale, digital tools are used at the cash desk, in particular the use of barcode scanners and digital payment. The use of barcodes is very much appreciated by customers and the company itself. On the customer's side, the use of the barcode allows for a quick checkout and a reduction in billing errors. As for the company, it reduces the waiting time at the checkout and facilitates inventory. However, as far as digital payment is concerned, it is not very well accepted by customers because the usage rate is below 5%. Customers do not adhere to this practice due to a lack of confidence.

The use of these digital tools within this company has favored speed in the sharing of information and the availability and sharing of information in real-time within the company but also and above all with external partners. Moreover, it has led employees to work with more discipline and in a reactive way, because in fact, tasks are carried out instantaneously and no longer have to be postponed to carry out a task. However, this is not easy given the poor quality of the telecommunication networks.

The next step in digitalization is the development of web to store, encouraging the use of digital payment on a technological level, but the company does not envisage the automation of its supply chain and on a strategic level the opening of several shops in other regions of the country.

Table 13: Characteristics of company X

Case	Information system and exchange	Negotiations	Digital technology	Next step of digitalization
Company X	- Calculation and commercial management software - Email - Physical documents	- Negotiation with suppliers; - Negotiation with the freight forwarder for maritime transport and for road and railway transportation	- Optical bar-code reader; - Social media.	- Web-to-store development - Encouraging the use of digital payment

Company Y

The interview in this company was conducted with the company's purchasing manager. It took place by telephone. The interview was conducted in two telephone calls which lasted one hour and 20 minutes respectively. After the first call, some misunderstandings have been noticed and so a second phone call has been made.

Procurement process

The procurement process remains the same for Company X with the only difference that this company has a very particular way of dealing with local suppliers who do not have the means to create barcodes to identify their products. In fact, to reference local products that do not have barcodes, this company requires these suppliers to pay a sum of 50000f CFA per year and per product. It justifies this sum by creating a temporary identifier for the product in order to facilitate the management of its stock and the passage at the checkout.

Information system and exchange

As far as the exchange of information is concerned, the company favors the traditional way of exchanging information, which involves the presence of paper support. Indeed, even if it uses digital tools such as applications to exchange this information, it nevertheless requires paper support to formalize the execution of a task. In this company, the first stage of digitalization is centered on social media because it increases its presence on social networks, for example, it is present and active on Facebook, Twitter, and Linkedin. It is reluctant to use intensive digital

tools because it believes that the environment is not conducive to this use, especially in view of the numerous disruptions to telecommunications networks, which is why it prefers the traditional method.

Perspective

Nevertheless, it still plans to develop online sales sites through the creation of a web to store, to turn more towards the digital transmission of information, and consequently to reduce the paper support and finally to open other shops.

Table 14: Characteristics of company Y

Case	Information system and exchange	Negotiations	Digital technology	Next step of digitalization
Company Y	- Calculation and commercial management software - Email - Physical documents	- Negotiation with suppliers; - Negotiation with local supplier for barcode creation; - Negotiation with the freight forwarder for maritime transport and for road and railway transportation	- Optical barcode reader; - Social media.	- Web-to-store development - Implementing the digital payment

Company Z

This is one of the companies where the study has been carried out by visiting the company. During the visit, some observations have been made related to the different practices within the supply chain.

Supply process

It is one of the largest national companies in the retail sector. Its supply management is similar to that of two previous cases. However, due to its size and the high number of products it sells,

which makes managing its suppliers a little complex. Indeed, managing foreign suppliers is very difficult because of their high number, there are as many suppliers as there are products and, as it does not have a central purchasing office, it has to manage all these suppliers at the same time, hence the complexity of its supply system. This cumbersome management has consequences at the point of sale, for example stock shortages on the shelves of the points of sale or even sometimes products whose use-by date has already expired. All operations are managed manually.

This company has a specificity compared to the other two because, within its points of sale, it has a department dedicated to the sale of hot ready meals. And this department is a dazzling success. The company has staff responsible for cooking local dishes. The ingredients for the dishes it cooks are not sold in the company's sales outlet, so it has to buy them from traditional markets. To replenish its supplies, it is in contact with many "buyer and seller" who are responsible for delivering the products needed to prepare the daily dishes. Since each dish has its own specific day, each "buyer and seller" knows which day it must deliver the ingredients so that the dish is prepared with fresh local produce.

Information system and exchange

The mode of information exchange is the same as for the previous company, i.e. the exchange of physical documents is preferred for the time being or the sending of emails and phone calls, but also sometimes rarely uses the Whatsapp application. As for the use of digital tools, it only uses the optical barcode scanner in the points of sale and for products that do not have a barcode, it uses the 50000/year/product strategy. However, it comes up against the use of these tools especially in the case of telecommunications networks which are unstable, but also and above all with the employees, almost all of whom do not master the functioning of these new technologies.

Perspectives

Nevertheless, in the coming years, it plans to set up an online sales site for hot ready-made meals and to open other sales outlets in other regions.

Table 15: Characteristics of company Z

Case	Information system and exchange	Negotiations	Digital technology	Next step of digitalization
Company Z	- Calculation and commercial management software - Email - Physical documents	- Negotiation with suppliers; - Negotiation with local supplier for barcode creation; - Negotiation with the "buyer and seller" - Negotiation with the freight forwarder for maritime transport and for road and railway transportation	- Optical barcode reader; - Social media.	- Web-to-store development; - Development of the online sales site for hot ready meals - Implementing the digital payment.

The description of the cases studied reveals similarities in the supply chain management of the companies studied. The companies that present the same way of managing are the companies of the same group. Thus, two distinct groups can be distinguished: on the one hand, there are foreign companies that form the first group (Companies A, B, and C) and on the other hand, there are domestic companies that form the second group (Companies X, Y, and Z).

The companies within the same group have almost identical supply chain management. However, the supply chain management of the companies in the different groups differs and this difference is mainly due to their information flow management system within their supply chain. To this end, the following section will be dedicated to the analysis of the information flow management within the supply chain of each group of companies (international companies on the one hand and national companies on the other hand).

4.4 Management of Information Flow in the Supply Chain of the Cases Studied.

Cameroonian retail companies do not have the same way of managing their supply chain. Given that the supply process is the same for all companies, the difference lies in their information flow management system which guarantees the success of the supply chain. In fact, foreign companies, especially French companies established in Cameroon have more success in the management of their supply chain, a management that is reflected in the points through the presence of products on the shelves. This section describes the functioning of the supply chain of foreign companies on the one hand and that of Cameroonian companies on the other hand and make a comparison.

4.4.1 Supply Chain Management of Foreign Retail Companies in Cameroon

The foreign retail companies established in Cameroon are mainly French, they are among others: CASINO, CARREFOUR, SUPER U... Indeed, the development of these companies on the world market in general and their establishment in Cameroon in particular makes the management of their supply chain complex because it is on the international level. These companies certainly reference Cameroonian products, but the majority of their products come from abroad, in other words, they are imported. Whether they are foodstuffs (especially cheese, drinks, and more), electronic and household appliances, clothing..., most of these products are imported from their country of origin.

4.4.1.1 Assortment

Foreign companies established in Cameroon have a very varied range of products at their disposal. A varied offer of food products and also non-food products. The offers are structured in departments in these companies:

- Fresh products department which consists of fruit and vegetables, poultry, butcher's, fish shop, delicatessen, cheese shop, etc...
- Departments of consumable food products in which you can find biscuits, drinks, and everything you can eat raw or cooked.

- Non-consumable products department, which consists of cleaning products, beauty products, decorative objects, etc...
- Appliances department which consists of large household appliances such as refrigerators/freezers, washing machines...; kitchen accessories and picture and sound equipment; electronic appliances...

Each department constitutes a turnover. Indeed, the most important turnover is that of the consumable food products department which makes up more than 50% of the total turnover of the outlet, then fresh products which make up 25%, then non-consumable products 22%, and finally household appliances 3%. This dominance of turnover in consumable food products is explained by the high turnover of this type of product. Indeed, these are products that are bought daily, their price is generally low. They are products that are bought spontaneously. Given the contribution of these products to the overall turnover of the point of sale, it is important to focus on these products in order to avoid any possible stock shortage and to have good quality products available.

Moreover, for the supply of these products, these companies use two channels: a direct and an indirect channel.

The direct circuit only concerns products purchased in Cameroon. When it is necessary to obtain supplies from local suppliers, the companies contact these suppliers directly and purchase the products; this is a direct circuit, which can be illustrated by figure 22.

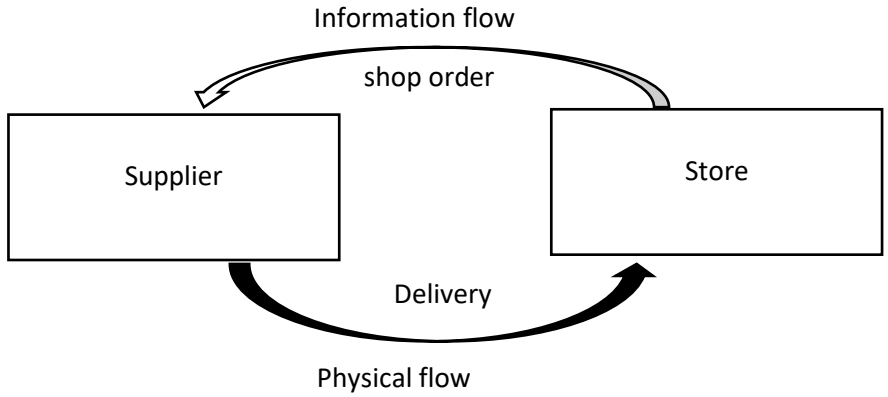


Figure 22: Direct Supply Channel
(Source: Author´s own elaboration)

In this circuit, the information concerning the order is transmitted as a physical document and the delivery times are communicated by telephone. The documents concerning the delivery are transmitted at the time of delivery.

The second circuit is the indirect circuit. In this circuit, an entity called a central purchasing unit intervenes as shown in the figure 23.

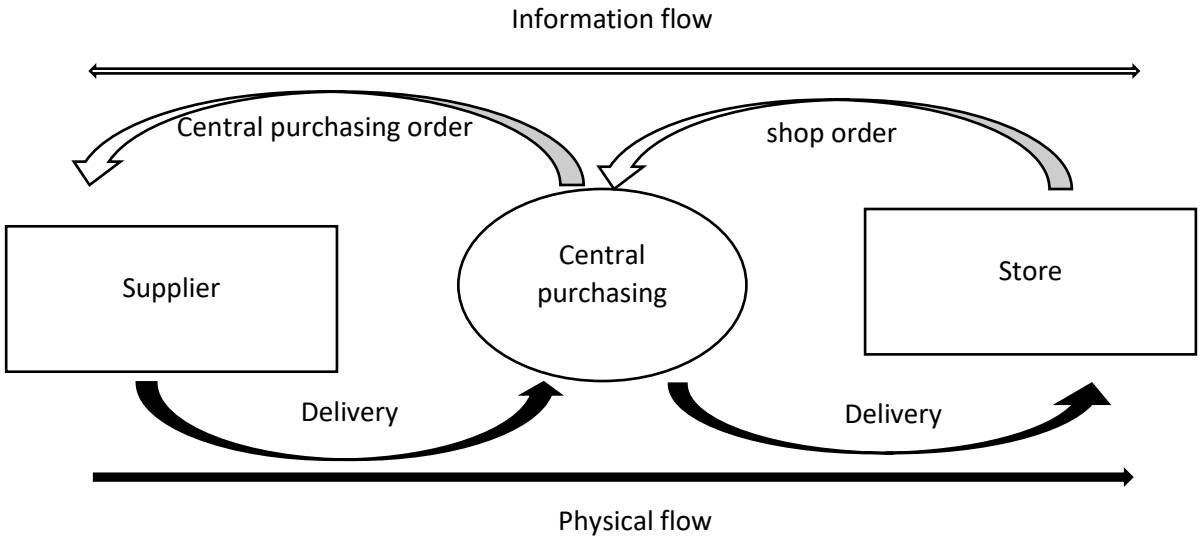


Figure 23: Indirect Supply channel
(Source: Author´s own elaboration)

As far as the foreign companies in the retail sector are concerned, they have a central purchasing office, when it comes to purchases made abroad. The central purchasing office enables a large number of suppliers to be managed. Indeed, the central purchasing office studies the products required lists the most interesting suppliers, and negotiates the best prices. In addition, it enables the grouping of distributor orders involving hundreds of suppliers in order to facilitate the supply process.

Once the orders have been transmitted to the central purchasing office, the latter proceeds with the purchase. As soon as the purchase has been made, the latter proceeds with the routing of the goods to the company's warehouse. After receiving the products, the company proceeds with the shipment to Cameroon.

In this circuit all the necessary information is transmitted by e-mail for the purchase process, however, for the administrative procedure on arrival, only physical documents are accepted.

4.4.1.2 Objectives

These companies established in Cameroon have set the following objectives:

- Ensure the availability of products on the shelves;

- Accelerate the rotation of products;

- Ensure the reliability and availability of information;

- Develop customer loyalty;

- Reduce costs throughout the supply chain (inventory management costs, delivery costs, etc.).

In addition, they also aim to offer an excellent quality of service in their various points of sale and to create a good collaboration with local suppliers.

Achieving these objectives requires the coordination of physical and information flows and the management of real-time operations within the supply chain, which is made possible by technological advances.

4.4.1.3 Information Flow Management in the Supply Chain Process

The supply chain of foreign companies established in Cameroon is managed by the ERP system. This system creates a shared database to manage and monitor all the company information. In fact, this system collects in the various databases the information from the different services or departments to bring them together in a single database.

In the case of the companies studied, the ERP system collects information from the finance department, logistics, and stock, purchasing and sales management, and customer relations in order to have a global view of the company's situation in real-time.

Table 16: Use of Information flow management tools

Information flow management tools	**% of use**
ERP system	60%
Applications and platform	20%
Manual	20%

In the supply chain of these companies, the ERP system is 60% used for programming, planning, and execution of operations, as they use for the majority of their internal activity, software associated with the system. The operations executed through this system are carried out in real-time. For the monitoring of operations and exchange of information between employees, applications, and platforms are used to the extent of 20%. Only 20% of the activities are carried out manually. In fact, manual management is more concerned with the operations of placing orders with local suppliers, because in the course of this process, information is exchanged both by phone and by the physical document. The manual exchanges are carried out at different times, i.e. the sending of information is not instantaneous.

The supply chain also includes a large number of activities: purchasing, transport, stock management, administrative operations, and handling. Each of these activities covers a more or less intense information dimension and requires more or less numerous tools. Thus, several means of information flow management are used within the supply chain of these companies.

- ***Order process***

In order to ensure that the products purchased correspond to the needs of the end customer, it is essential to define the exact requirements before placing orders. This step determines the smooth running of the procurement process within the company. It starts with the purchase of the product by the consumer at the checkout, by scanning the product barcode with an optical scanner, the stock level is instantly updated in the company's stock management system, which connects the information flows at the point of sale and at the stock management module level.

This system is designed in such a way that the security stock is defined so that when sales are made, the stock is updated at any time, the system links the point of sale and the stock management department, and the information flow is carried out in real-time. As soon as the safety stock is reached, the system sends a signal that warns the person in charge of the department management of the product concerned and also the purchasing manager and all the hierarchy that the safety stock of the product concerned has been reached. This signal is sent as a notification and is done automatically.

Once the notification is received, the purchasing department proceeds to determine the quantities to be purchased. This operation considers the data related to the environment of the point of sale, such as the effect of promotions or actions of competitors, fluctuations in previous sales,

the period (as the consumption of certain products depends on the period. Some products are consumed more during a specific period of the year).

After considering these elements, the purchasing manager determines the quantities to be ordered using the APS (Advance Planning and Schedule) software package, which enables him to plan purchases according to the resources available. This software package considers the following elements:

- Nature and technical specifications of the product;
- The quantities required for the period;
- The safety stock;
- The mode of execution of the delivery, which can be a single delivery or spread over time;
- The means of delivery;
- Delivery times;
- The number of suppliers ...

Once the quantities have been determined, the purchasing manager formalizes the requirement in the form of a purchase requisition which he prints out. This request is sent to the hierarchy, which will be responsible for forwarding the request to the central purchasing office by email by scanning the signed slip in which the products and their respective quantities are clearly specified. These companies use the central purchasing department because of the high number of suppliers complicates the purchasing process.

On receipt of the order, the central purchasing office must check whether the data relating to the identification and constitution of the commercial units, such as the GTIN (Global Trade Item Number) or the EAN standard standards, the Logistic Units that make up the Consumer units and the total volume of the order are mentioned. Once the central purchasing office receives the order, it first sends the order confirmation and then sends the dispatch advice before the goods are dispatched. This document informs the company about the nature of the product, the quantities, the delivery time in order to allow the company to prepare its incoming logistics. The goods will then be dispatched. The company can possibly acknowledge receipt of the goods by confirmation of receipt message. The last step is the presentation of an invoicing message.

The following illustration (Figure 24) gives an overview of the different information flows in the form of documents of a supply process that occur in the studied retail companies.

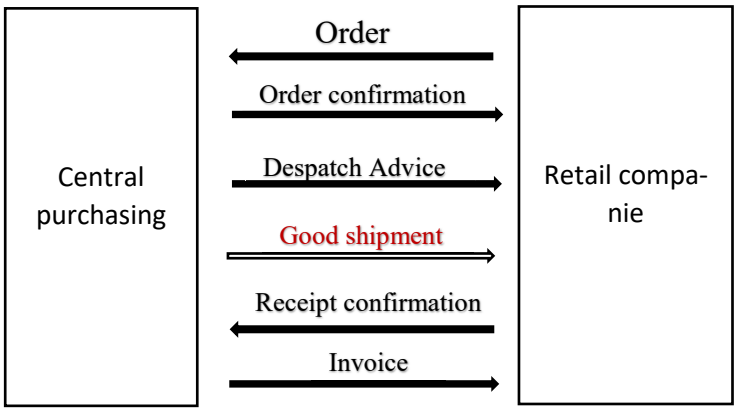


Figure 24: Exchange of Documents in a supply process in the retail companies
(Source: Author´s own elaboration)

The exchange of these documents is done through electronic messages. The process described above only concerns the cases studied. Different types of documents may be used, depending on the participating partners and their requirements.

- ***Maritime transport of goods***

When the goods leave the central purchasing center's warehouse, they are placed in the containers intended for this purpose. In fact, the products are placed in the containers according to their nature. Let's take the example of fresh products that require special management, these products are put in refrigerated containers that are able to maintain the products at a certain temperature regardless of the external conditions. These containers allow the goods to be kept at a temperature ranging from -25 to +25 degrees in order to maintain the quality of the goods and avoid any possible deterioration. The products destined for Cameroon that can be stored in this type of container include dairy products, meat, fish, and fruit. The other product categories are packed in ordinary containers. Once the stuffing process is completed, the containers are transported to the port of departure for Cameroon.

The containers have identification numbers and each container is equipped with a GPS chip that allows it to be geolocated so that its exact position can be known at all times. This geolocation is done in real-time when the internet connection is good and at a very high speed.

Generally, the products marketed in these shops come from France, thus leaving France to be transported to Cameroon, the products are transported by sea because the journey between

France and Cameroon and would not have been done by land and also because of the low cost of sea transport compared to air transport and for reasons of high quantities which amount to thousands of tons. These goods depart either from the port of Le Havre or the port of Marseilles. But the great majority of the imports of these companies of the large-scale distribution is carried out from the port of Le Havre.

As soon as the containers are transported to the port, the operation of loading the containers on board the ship begins. Once the ship is loaded, and the administrative procedures have been completed, the ship can finally depart for the Autonomous Port of Douala. The average journey time at sea is 22 days and the distance to be covered is 4838 nm (nautical miles).

The route to be covered by the ship from the harbor to the Autonomous Port of Douala can be illustrated by the following map (Figure 25)

Figure 25: Maritime Itinerary of major imported goods
(Source: Author´s own elaboration)

The arrival of the ship at the autonomous port of Douala is planned several days in advance with a margin of error of 1 to 3 days in case of unforeseen events that may cause delays. These unforeseen events may be due to natural conditions such as the weather or technical problems. In fact, on arrival, the ship can only dock in ports with a customs office. As soon as the ship reaches the clearance radius, customs officials inspect the goods that have arrived.

- ***Administrative procedure on arrival***

When the boat arrives at the autonomous port of Douala, the captain of the ship submits the original manifest (the document which details the goods on board the ship, i.e. information on the nature of the goods transported, the number of packages, the weight of the goods, the numbers and marks of the goods, and their place of origin) and all the necessary documents to the customs officers. Once the verification has been made and there is conformity between the goods transported and the documents, the company can recover its goods which will be transported in the containers on board the trucks provided for this purpose to their warehouses or shops. The administrative procedure generally takes 6 to 8 weeks. Indeed, the waiting time for goods is very long, as the average time is estimated at 7 weeks for imports. This is due to the customs formalities, in particular the delay in the payment of customs duties on the goods by some importers, in addition, all documents are submitted as physical documents and only upon arrival.

- ***Manutention***

The handling of goods is an integral part of supply as it affects the loading and unloading of means of transport such as ship (port handling), truck, and train wagons (rail handling).

In the case of retail companies that import products into Cameroon, the three types of handling mentioned above apply throughout the supply chain.

In fact, it is first of all about port handling which consists of unloading the goods on board the ship. In the autonomous port of Douala, the Harbour Handling with Big Bag system (H2B2) invented by Jean Paul Kamga Nenkam in 2004 is used. Indeed, it is a loading and unloading system that allows to embark and or disembark between 500 kg and 3 tons of goods in one go. Thanks to this system, the dockers can unload 3000 tons of goods in one day. This system facilitates the handling of goods, makes the process faster and therefore reduces the ship's stay on the quay, fights port congestion both at the quay and in the warehouse, improves stock rotation in the warehouses, reduces costs and delays in the port passage and also reduces operating costs. It allows the company to quickly take possession of the products. Once the ship unloads, the merchandise is stored in the warehouse hold waiting to be transported either to the warehouses in Douala or to Yaoundé.

During this stage of handling, only the security of the warehouses is emphasized, as there are many surveillance cameras that allow them to see the movements within the warehouse.

However, these images only concern the agents working at the port, as the company does not have access to these data, including the data related to the conservation of the goods. Indeed, RFID technology is also used to identify the exact position of the containers of goods, but this data is also not accessible to the customer (i.e. the company).

Thus, the port handling ends with the start of loading of the goods on board the trucks for transport to the specified place. Truck loading is an operation that consists of putting the goods on board the trucks. It is carried out according to the transport vehicles available and according to the goods to be transported. In fact, the products are transported in categories according to the requirements necessary to preserve the quality of the products. Fresh products are transported in the refrigerated container in order to keep them at a suitable temperature; as regards drinks, the crates or pallets are stacked on top of each other to maintain the balance of the pallets in order to facilitate transport. Once the loading is finished, the goods will be covered with an adequate blanket to avoid the deterioration of the goods by the sun or rain during transport.

Rail handling refers to products that have to be transported by rail. These products are loaded onboard the wagons of the Camrail company (the only railway transport company in Cameroon) at Besingue station to Yaoundé station.

Upon arrival at Yaounde station, the goods are unloaded from the wagons and are transported to the storage warehouses of the companies concerned. These storage warehouses are generally not far from the points of sale in order to avoid transport costs to the point of sale.

- ***Transport***

The transport of goods is carried out by subcontractors with whom the company has signed a subcontracting agreement. There are only one means of transport between the port and the goods storage warehouse in the city of Douala: Road transport. When the goods arrive at the autonomous port of Douala, after all the administrative procedures, the goods are loaded on board the service providers' trucks to be transported to the storage warehouses. These warehouses are located tens of kilometers from the port.

Concerning the warehouses located in the city of Yaounde, there are two options for transporting their goods to the place of storage and or sale:

- Transporting goods by road from the autonomous port of Douala to the city of Yaounde;

- Combine rail/road transport. At this level, the first step is to transport the containers of goods from the autonomous port of Douala to Besingue station by truck, given that the port and the station are not in the same place and that there is a certain distance between the two. Secondly, when the lorries arrive at Besingue station, the goods are unloaded from the lorries and then loaded onto the wagons.

The choice of the combined means of transport for the Douala Yaounde journey depends on the nature of the goods being transported. In fact, some goods such as fresh products need to be kept in refrigerated containers and these contents need to have an energy source to feed them, which is why they have to be transported by train, which provides an energy source that allows feeding the refrigerated containers in order to keep the goods at an appropriate temperature in order to avoid any possible deterioration. In addition to conservation, rail transport is faster than road transport. In fact, the distance between the Douala and Yaounde railway stations is 265 km and the average journey time is 5 hours. However, the journey from Douala to Yaounde by road takes longer because of traffic jams on the heavy road, poor road conditions, and traffic accidents. These two problems lead trucks to take longer to get out of Douala, especially at YASSA, which takes an average of 4 hours. This situation is not beneficial for companies looking for speed in the means of transport. Indeed, when choosing a mode of transport, companies must consider the requirements of speed, availability, adequacy with the goods transported, and cost.

As the objective of retail companies is to satisfy their customers in order to gain their loyalty, they must rely on the efficient management of their supply chain and for this reason, the choice of means of transport is essential.

Decisions related to the choice of transport mode are generally complex because the means of transport chosen can have an impact on the selling price of the product, delivery times, and the delivery in good condition of the goods transported. All of these elements affect the functioning of the company's supply chain and therefore have an impact on customer satisfaction (Kotler et al., 2006). To this end, the combination of rail-road transport modes is more efficient for retail companies in Cameroon because it is subject to fewer traffic accidents (accidents on the railways are rare), it is faster and more efficient and the risks of deterioration of goods are low.

The efficient transport of goods enables delivery times to be kept under control. On-time delivery ensures that the products are on the shelves of the points of sale, builds customer loyalty, and increases the company's profitability. The transport link in the supply chain is the fundamental and essential element in its operation.

As the transport system is the backbone of the logistic chain, it has to be controlled in real-time in order to ensure the follow-up and the respect of the established schedules. For this purpose, several electronic transport monitoring devices can be used: from digital alarms and signals to satellite tracking of the trucks thanks to the GPS installed in these vehicles. In fact, in the study context, the vehicles are only equipped with GPS, which only gives information about the vehicle's position. In addition, the retail companies established in Cameroon have a dedicated platform which, thanks to the identification number of the container, traces the route taken by the goods and identifies the position of the goods in real-time in order to know the delivery date.

- ***Warehousing Management***

It consists of accommodating the goods in special places reserved for this purpose. They are built to accommodate and protect a large quantity of merchandise intended for sale in the points of sale. The distribution companies established in Cameroon have storage facilities for goods near the points of sale. These warehouses are generally located at the back of the points of sale, in order to avoid the transport costs that can arise if the warehouses are located far from the points of sale. Indeed, the number and location of the warehouse depending on the importance of the flow of goods (fragility, quantity, diversity of references and suppliers, etc.), the location and number of sales outlets to be served or customers to be satisfied. These distributor warehouses take on the role of receiving goods from the various suppliers, managing reserves, preparing orders for the points of sale, and, finally, ensuring delivery.

In these warehouses, space and infrastructure are optimized for the type of goods stored. For example, foodstuffs are stored on one side and hygiene products on the other, and for fresh products, a cold room is built for this purpose to house these products in order to keep them at the right temperature. These warehouses have a lot of specific equipment such as forklifts that lift a large number of products, shelves, and lifts.

The goods are arranged in the warehouse in such a way that the first goods to enter are also the first to leave, as these are perishable goods that cannot be randomly arranged because the expiry date must be considered.

The management of the warehouse of the companies established in Cameroon is done thanks to the WMS (warehouse management system) software package which allows the optimization of space, the planning of tasks, the synchronization, regulation, and optimization of process

flows, the management of entries and exits, the entry of the inventory and the realization of statistics. This software package combined with the use of identification technologies such as barcodes allows these companies to manage their warehouses efficiently, which is why these companies do not accept any product without a code, as this manager states: *"We do not accept any product that does not have a code". "For local suppliers who do not have a barcode on their products, the best thing we can do for them is to offer them a training seminar on the creation of barcodes, so that they can design an identifier for their products, even if it is only on a national level".*

- ***Stock management***

The level of stock in the retail companies is important information that can indicate shortages or overstocks with huge costs. The companies of our sample have experienced some problems related to the management of their stock due to the two previous cases (shortage and overstock). This situation has led these companies to launch promotions on the products some days before the expiry date in order to minimize the damage. It has often been observed on the shelves that the prices of certain products are reduced by 90% on the eve of their expiry date in order to minimize damage.

During this time, they have had to overcome these problems thanks to their ERP system which links the information from all departments and synchronizes it in order to make an efficient decision. Using this system, they were able to assign serial numbers to different expiry dates so that the system could automatically generate a list of items with the earliest expiry date to reduce waste.

- ***Point of sale management***

All the foreign points of sale in this study are equipped with barcode scanners that allow the data to be entered at the checkout when making a purchase. Each checkout is equipped with a barcode scanner that allows automatic entry of the sale of a product in order to issue the invoice as well. In addition, each cash register is also connected to the stock management system, which updates the stock level each time a sale is made. In fact, each cash register is also equipped with a credit card payment terminal. However, in all the outlets in the study, this payment solution is not appreciated by customers, with only 5% of customers using it. Payment by cash is the most popular method of payment because customers are wary of paying by bank card for fear

of exposing their bank details, which are considered too sensitive, as one customer said, *"I don't trust, Ummm me, exposing my money like that, umm it's madness that way and if someone hacks me, no no, no way"*.

4.4.1.4 Inter and Intra-company Information Exchange

The companies in the sample have set up platforms for exchanging information between company employees, in addition to the platforms, some have created WhatsApp groups for instant exchanges between employees in the same or different departments.

For information exchange with external partners only e-mails are used, no exchange through social networks or applications. Telephone calls are used to contact the partners when an operation has been launched.

To ensure their visibility, these companies use social network Facebook, which presents the company's profile. Through this channel, the company often communicates news within its points of sale. In addition, they also have a website that presents the company and gives the location of the points of sale in each city, as well as the opening and closing hours. These sites also show the new products that the company has just put on its shelves and any promotions at certain times. These sites and social media are just for the customer's information as there is no possibility of interaction between the customer and the company through these tools.

The system set up by the majority of foreign retail companies in Cameroon to manage the supply chain is the ERP system. This system allows to centralize and structure data in order to facilitate the exchange between the different departments of the company. In this way, all the company's departments have access to information in real-time, the process is then optimized. In this system, all the information is entered once and can be used later by the different departments, this information is updated in real-time. These companies tell us that thanks to the ERP system, all employees can access the following information in real-time:

- The stock level;
- The sales level;
- Probable timing of future deliveries;
- The financial statements.

Thanks to this system, these companies ensure the availability of the products on the shelves, there are fewer stock shortages, the products sold are in good condition and the expiry dates are respected thanks to efficient stock management which avoids overstocking certain products.

There are advantages to this system:

- Avoid loss of data;
- Allowing a simplified analysis of operations;
- Allows a permanent follow-up of the operations in progress;
- Ensures a gain in productivity.

Despite these advantages, this system nevertheless has a disadvantage, according to the companies in the sample, and that is compliance with the rules, which appear to be very restrictive for employee.

The management of the information flow in these companies is more or less digital. However, not all the information is taken into account in the decision making process because, in this supply chain, only structured information (the different transactions of the company) is taken into account, the other information coming from various sources (environmental data, social media data, customer data...) is not taken into account because these companies do not have a mega database which gathers this data so that it can be analyzed and processed and considered in the decision-making process.

Indeed, companies use these tools only to send and receive information. The data that may be contained in these different tools are not considered in the decision-making process. All the tools used are only used to communicate and there is no consideration of the data that may result from these tools.

In addition, these companies plan to increase the use of digital within their supply chain by automating the entire supply chain and developing e-commerce.

The table 17 presents all the elements discussed during the interviews in these companies.

Table 17: Summary table of the supply chain of retail companies implemented in Cameroon.

Supply process	**Negociations**	**Transport modes**	**Informations managment system**	**Digital technologies**	**Next step of digitalization**
Identification of needs ; Placing the order (central purchasing and local suppliers); Receipt of good; Storage; Bill payment; Stock management; Point of sale management.	Central purchasing; Local suppliers; Transport service providers;	Maritime; Road; Railway;	ERP system; APS for planification; WMS for warehouse management; Share point; WhatsApp group; Phone calls; Mails.	Barcode reader; Digital payment; Social media; GPS to trace the position of delivery vehicles;	Automation by implementing the EDI system; Implement the E-commerce;

4.4.2 Supply Chain Management of Cameroonian Retail Companies

The local retail market has been expanding rapidly in Cameroon for several years. The dominant national companies in this sector are SANTA LUCIA and DOVV, as they have been more successful in the national market in recent years. However, with the arrival of the international giants, the market has become very tough and the importance of a good supply chain management has been highlighted. As a result, these companies have put in place several strategies and targets to be more efficient in the face of this tough competition.

4.4.2.1 Assortment

Cameroonian companies market several types of products categorized in department which are distinguished from each other:

- The fresh products department is composed of fruits and vegetables, poultry, butcher's shop, fish shop, delicatessen, cheese shop, etc... however, this department is not very varied because of the supply process considered too complex;
- Edible food products department in which you can find biscuits, drinks, and all that you can eat raw or cooked;
- Non-consumable products department, which consists of cleaning products, beauty products, decorative objects, etc...
- Fast food and snack;
- Pastry department.

The departments that are most relevant to these companies are the edible and fast-food departments. These two departments account for half of the turnover of these companies, followed by the non-consumable goods department.

The supply channel for all these products is a direct one. That is to say that the company does not have a central purchasing office to organize the purchase of all these products, the company is in direct contact with all these suppliers. It manages its suppliers and this management is difficult and complex because there are as many suppliers as there are products.

4.4.2.2 Objectives

The objectives of these companies are, among others, to:

- To cover as much of the national market as possible (one point of sale in each district);
- Diversify the offer to customers;
- To be closer and closer to their customers;
- To implement online fast food commerce.

In order to achieve these objectives, good coordination of the physical flows associated with the information flows is necessary.

4.4.2.3 Information Flow management in the Supply Chain Process

The supply chain in the retail industry is managed almost manually. These companies do not have an information management system that links all company departments. Indeed, these companies use commercial calculation software to manage their activities (order management, warehouse management, stock management, and point of sale management). The rest of the activities within the supply chain are managed in the same way as foreign companies (warehousing, handling, transport) because it does not depend on the companies themselves, some activities depend on the forwarding agents, port agents, and customs agents as far as administrative procedures are concerned. Therefore, this section presents only those activities whose information flow is managed in a different way.

The table 18 presents the percentage of use of the different tools in the management of the information flow within these companies.

Table 18: Use of Information flow management tools

Information flow management tools	**% of use**
Manual	80%
Applications and platform	20%

In fact, 80% of the information flows in the process are managed manually, which means that the information circulates during the activities through outgoing or incoming phone calls, physical documents sent by e-mail or fax, or as a core part of hand-delivered documents. Moreover, only 20% of this flow is managed by applications, software, and other tools.

- ***Order process***

The ordering process begins when the product is missing from the shelves. Thus, when the department manager notices this absence, he approaches the warehouse to see if the product is available in this warehouse, if not, he formalizes a purchase request that he transmits to the supply department, which proceeds to determine the quantities to be ordered. This situation arises in the case of a total stock shortage.

In most cases, this procedure is initiated when the security stock is reached, as the company carries out the inventory and when the security stock is reached, the order procedure is initiated. The inventory of products is done manually by counting the products in stock or by checking the last registered stock and the sales made in order to find the remaining stock. Thanks to some commercial management software such as Sage Sari and operating software, the company records manually the entries and the exits and therefore they have an overview of their stock.

When the safety stock is reached, the stock manager signals it to the supply department, which determines the quantities to be ordered and thus draws up a purchase order which it sends to these suppliers, usually by e-mail or telephone call. When the order is transmitted electronically, the supplier prepares the order. In some cases, the order forms are transmitted in person by the suppliers' sales representatives who come to the company to collect the order forms (in the case of local suppliers).

The procedure for issuing a purchase order is done manually either with software in which all the necessary information should be entered or by hand. In both cases, the purchase order is then scanned and then sent by email.

The exchange of information in this process is done with the help of documents, as these companies usually require a paper medium. It is the presence of a paper medium that makes the order official and effective.

As far as purchases from local suppliers are concerned, each point of sale places its order according to its needs. The point of sale determines the quantities and draws up the order form which it has signed by the competent department and then it places its order directly with the supplier.

After sending the order to the foreign suppliers, the company receives a document called a proforma invoice (a commercial document that resembles the final invoice but without having legal value, which serves to start a commercial process, in a way it is an example of an invoice without being a real one). As soon as the company receives this proforma it sends its confirmation by e-mail or by phone that it agrees and that this proforma invoice corresponds to its expectations. Thus, when the supplier receives this confirmation, it also sends the sell-by date charter which indicates the consumption periods after which the food products present a danger to health.

The exchange of all these documents is done by e-mail between the different actors. When all the documents are in conformity, the supplier prepares the order for dispatch.

Furthermore, before the products are shipped, a request for a quotation is sent to the forwarder to find out how much the transport of the goods requires, i.e. means of transport, prices, and transport time. In this way, once the company agrees with the supplier, the goods can be shipped. Most of the products are imported from Europe and therefore they are shipped by sea and the transport process, administrative procedures, handling are the same as for foreign companies until the products arrive in the warehouse of the company in question.

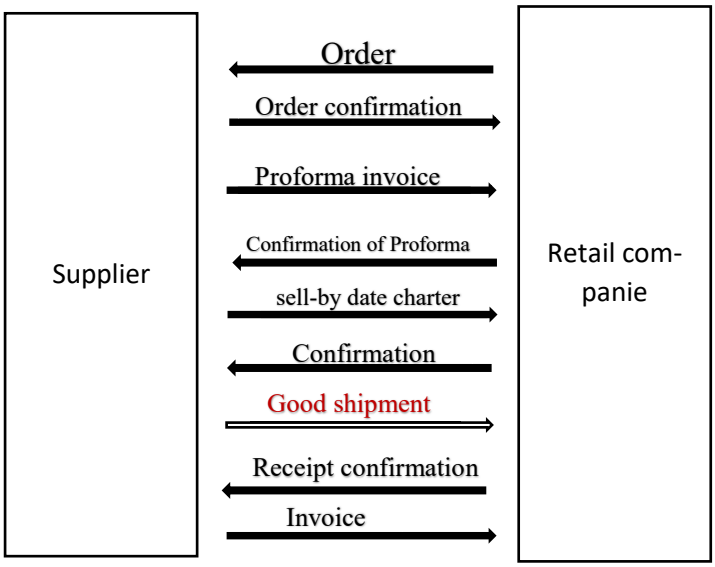


Figure 26: Exchange of documents in a supply process in the Cameroonians retail companies (Source: Author´s own elaboration)

In the order management process of Cameroonian companies, there are more documents than those of international companies. These documents are of great value to these companies because they are all kept. Nevertheless, the most important document for all of them is the sell-by -date charter, a document that is very essential in stock management.

The management of international purchases is more complex because there is a high number of suppliers, in fact the number of products sold by the companies is equal to the number of suppliers to be managed.

Contrary to foreign companies that have a central purchasing office that makes all their purchases and manages multiple suppliers given the number of products referenced in the shops, Cameroonian companies do not have a central purchasing office and therefore they manage their suppliers themselves. In fact, there are as many products as there are suppliers, given the

high number of products referenced in the point of sale; the number of suppliers is also high. Without a central purchasing office, managing these suppliers becomes a very complex task for these companies, with consequences for the point of sale. Indeed, a Cameroonian supermarket manager stated that *"...European companies are able to obtain supplies quickly where local companies take too much time to import because of number of suppliers to manage"*. This long waiting time for imports causes stock shortages, especially for products with a high turnover rate, hence the absence of products at the point of sale, resulting in a huge loss of income since products with a high turnover rate are those with the highest profit margin. This situation leads these companies to anticipate orders in order to avoid stock shortages.

This anticipation is not without effect on the company because most of the time they are confronted with overstocking. Because they do not have a database that allows them to make a predictive analysis to predict future demand, they are faced with a lot of poor predictions of the future.

Thus, the procurement process becomes a major challenge for these companies, with a high number of suppliers - at least 700 suppliers for most of these companies. The individual management of these suppliers becomes very cumbersome as there is a large volume of information to manage which makes the process long and tedious.

In addition, manual management makes the workload even heavier and management is slower, resulting in a slower procurement process.

In addition to the high number of suppliers, these companies also face product management. Indeed, the products purchased by these companies from foreign suppliers all have a barcode to identify them and facilitate sales management. Local suppliers, on the other hand, do not have the resources to create barcodes to identify them. In addition, to market products that do not have barcodes, these companies require suppliers to pay 50,000f CFA per product per year. In return for this sum, these companies create an identifier for each product that is capable of identifying the product in its point of sale. This identifier is only valid for the company in question and only its points of sale can use this identifier.

- ***Stock management***

The delivered goods are received by the warehouse keeper as the goods will be stored in the warehouse. The warehouse keeper receives the goods with a delivery note issued by the supplier and then checks the goods manually. In fact, the warehouse clerk first checks the quantities

delivered by counting the number of packages and compares them with what is written on the delivery note. After checking the conformity of the order, he proceeds to check the quality of the goods delivered. This check consists of examining the packaging of the products to ensure that the extrinsic qualities of the product are intact.

Stock management is done manually. When the products arrive in the warehouse, the company records the quantities that have arrived in their management software and the new stock is added to the old stock to form the current stock of the company. After each sale, the quantity sold is manually subtracted from the remaining quantity.

The products that do not have a barcode on arrival are registered in the software by assigning them a reference number which is recorded in the computers present at the cash desk for efficient management of sales. The products are managed according to their sell-by date. This document allows the storekeeper to arrange the products in such a way that the products with a close expiry date are first out of stock, thus, the batches of products are arranged according to their sell-by date to avoid the expiry of the products.

However, the information relating to the expiry dates is only present on the sell-by date. For this reason, this document should be kept and consulted daily to know which batches of products will be put on the shelves first in the points of sale... In addition, there is as many sell-by date documents as there are products in the shops.

- ***Point of sale management***

The points of sale need efficient management to be profitable. This implies, in particular, the management of the cash register and the shelves.

In the companies in our sample, cash register management is done through the use of two tools:

The barcode reader which allows the entry of sales at the cash register in order to establish an invoice for the customer. This tool is used by the majority of Cameroonian companies in order to facilitate the passage to the checkout and to avoid errors that can result from manual invoicing.

The second tool is a computer in which there is a database of all the products present in the shop. Thus, when the customer arrives at the checkout to pay for the product they wish to purchase, the cashier calls up the product in his database by entering the item reference through his keyboard, thus the price of the item appears and the customer proceeds to payment and the

invoice is issued with a click. This second technique is too time-consuming and is prone to many errors and also causes a lot of loss of time. But it is still used by many distributors in Cameroon.

With regard to the method of payment, among the companies in this sample, only one company (Cameroonian) uses the card payment terminal, the rest of the companies have not yet set up this method of payment and therefore all payments are made in cash at the cash desks. These companies believe that this method of payment is not yet accepted by customers, and even the interviewed managers said that they cannot use it even if it existed in their own sales outlets, according to one of the respondents, *"I wouldn't use this method of payment even if it existed here, um, I don't trust it at all"*.

There are shelf managers in these companies who ensure that the products are always present.

Furthermore, all these points of sale are equipped with surveillance cameras to prevent theft in these shops.

4.4.2.4 Information System and Exchange

The information system is designed in such a way that the entry of all information is manual there is no coordination between services or departments, the information must be transmitted at all times to the service concerned. There is no system that synchronizes all the information and to which each service can have direct access, so this slows down the execution of tasks. In addition, these companies use one of the sales calculations and management software packages that enable them to make an inventory and draw up invoices. With this software, it is necessary to take the time to enter the information manually, transmit the information, check it, and ensure that it is not modified or contain errors.

This information flow management system within these companies is prone to a lot of errors in the processing of operations and is also cumbersome in the execution of tasks. This the major problem in the management of this information is related to the management of product expiry date documents. Indeed, these documents are so numerous that their management becomes very difficult. This management difficulty is linked to the fact that these documents are often lost or misplaced, which prevents the storekeeper from destocking the products according to their expiry date and the products remain in the warehouse until they expire. This situation causes a lot of loss for the company because they always register a large volume of products whose date has expired or almost expired, which causes a lot of problems, which is why there are always

promotions (discounts of up to 90% of the normal selling price) of the products a few days before their expiry date.

The exchange of information takes place through phone calls, faxes, emails, and the WhatsApp application. In these companies, even if the information has been transmitted digitally, a physical document is also required to make the operation formal.

The use of this manual system leads to loss of time, falsification of certain documents, but also and above all to errors in the manual entry of data.

The presence of these companies on social networks for communication purposes is very low: Facebook pages exist but are not very active, few consumers follow these pages and even these companies rarely update the information present.

Table 19: Summary table of the supply chain of Cameroonian retail companies.

Supply process	**Negotiations**	**Transport modes**	**Informations system and exchange**	**Digital technologies**	**Next step of digitalization**
Identification of needs; Placing the order to different suppliers; Management of suppliers; Receipt of good; Storage; Bill payment; Stock management Product shelving.	Foreign suppliers; Local suppliers; Transport service providers;	Maritime; Road; Railway;	Manual information management system with calculation and invoicing software; WhatsApp group; Phone calls; Mails.	Barcode reader; Social media; GPS to trace the position of delivery vehicles;	Implement the E-commerce; Development of web to store.

4.5 Analysis of the Efficiency of these Supply Chains

Interviews conducted within international companies gave us an insight into the system and tools for managing information flows within the supply chain. Good management and exchange of information enable tasks to be carried out as efficiently as possible within the company in general and logistics performance, in particular, to be improved.

In this context, supply chain managers in international companies assume that synchronization of the flow of information and the flow of materials is one of the basic principles of supply chain management. This synchronization is achieved through the exchange of information, which is achieved through the implementation of integrated flow management software packages, as shown by the comments made to Mr. ZZ, head of the logistics department of company Y: "*To manage our flows within our supply chain, we have used the ERP system in which the APS application is integrated. These applications complement the digitized mechanisms for exchanging information that we already had in place".*

Indeed, the use of these digitized mechanisms has brought significant changes in the management of activities such as stock management, delivery management, management of shelves in points of sale, and thus order management.

4.5.1 Supply Management

Thanks to the implementation of the ERP system, the company knows the level of its stock and the date of the next deliveries, therefore through this information, it knows when the next orders will be placed. This system has enabled these companies to set up a screen to enter order information such as quantities, delivery dates, and invoicing. In this way, sending the order digitally becomes faster and the arrival of the order to the supplier is almost certain, as the purchase order is not likely to get lost on the way. This system improves the efficiency in the processing of transactions because the order is only sent at the right time. The system allows these companies to have a global view of all services thanks to the common database in order to have the necessary information for good decision making. In contrast to these companies, the manual management of orders is very cumbersome, especially when dealing with a large number of suppliers. The information on all these suppliers has to be kept separate, there is also a repetitiveness of tasks and processes and the management of the chain is not coordinated due to the lack of real-time connection of the different company departments, which leads to many delays in the processes.

4.5.2 Shelf Management

The companies that have succeeded in setting up a computerized system (mostly foreign companies) have a well-stocked assortment because the shelves in these sales outlets are always well stocked and there are fewer and fewer stock shortages in these outlets. This constant presence of the products in the point of sale is due to the up-to-date stock management thanks to a computerized system, according to this manager: *"We have had almost no stock shortages since the updating of our stock level is done in real-time, and we make decisions accordingly, the time when we had to wait until the shelves were completely empty to start the supply process is over,"* he says: *" ... it's great, you know, now that we don´t even need to go through all the shelves of the point of sale and the storage shops to know what we have in stock... well at the end of the day it only takes one click to get this information... isn´t so great?"*. He goes on to say*: "You know, the products are in the right place at the right time and this avoids customer complaints." "In addition, we place particular emphasis on customer satisfaction, which is why it is out of the question that our shelves are empty ... and we do everything we can to achieve this"*.

In contrast to these companies, companies that manage their system manually have difficulties in managing products on the shelves. They are almost always faced with stock shortages. In fact, there is an irregular presence of products on the shelves in the points of sale. It is therefore rare to find certain products twice at the point of sale. This situation is due to the fact that the inventories are not made in time to know the products that need to be restocked, as this interviewee explains *"we have so many products to manage humm... so much inventory to do, we have to count, enter, calculate.... You know, it's a real headache this story", "we are always overwhelmed by calculations and figures, we spend days doing calculations and counting more than 700 references are actually a lot..."*.

This situation makes customer loyalty almost impossible. The manual management of activities leads to cumbersome task management and a lack of synchronization which results in stock shortages for certain products (high turnover products) because the stock level is not known in real-time and therefore these companies are only aware of the product stock level after a physical product inventory procedure. Furthermore, between the time of the inventory, the determination of the product's need, the placing of the order, and receipt, the safety stock is already exhausted, especially for imported products because the delivery time is very long. For some products, there is overstocking, these are products with a low turnover which causes these products to expire. This situation most often leads companies to launch promotions a few days

before the expiry date of the product. The products that are affected by this type of situation according to what has been observed in points of sale are:

- Products in tins;
- Biscuits ;
- Fruit juices in cartons ;
- Certain spices ;

These product categories are almost always in overstock.

4.5.3 Knowledge of Stock Levels

Thanks to the digital system, knowing the stock level is easier through barcode scanning at the checkout, the stock level is automatically updated and is known in real-time. In fact, the ERP system implemented by the majority of foreign companies allows them to have real-time information on the stock level, because when the product passes through the checkout thanks to its barcode, the stock of remaining products is updated directly and in real-time and the carrying out of inventories becomes easier.

However, companies that have not implemented such a system are forced to carry out inventories at the end of each day in order to know. This inventory is done either by comparing the previous day's stock with the day's sales in order to find the remaining stock or by physically counting the goods. These procedures are very long and tedious for the staff in charge.

4.5.4 Delivery Time

Compliance with delivery times is not dependent on the distribution company, but on the supplier. However, the company can estimate this time thanks to certain digital devices such as GPS integrated into the delivery vehicles. This device allows the company to have an exact idea of when it could be delivered. Knowing the position in real-time allows a solution to be quickly found in the event of a malfunction that could delay the delivery of the product so that it cannot have disastrous consequences for the company.

The table 20 presents the differences observed in the supply chain management of these two groups of companies.

Table 20: Differences observed in the management of processes within the supply chain of retail companies in Cameroon.

Elements	**Foreign companies**	**Cameroonian companies**
Transmission of orders	Digital documents	Digital and physical documents
Delivery times	Long	Long
Knowledge of the stock level	In real-time	After counting
Inter and intra-company information exchange	Digital document	Physical document
Presence of products in the shelves	Strong	Weak
Promotions due to the expiry date of products	Low	Strong

Looking at this table, it can be noticed that foreign companies have more control over the management of the different processes within their supply chain, this is due to the implementation of the ERP system for the management of information flows associated with different software. Thanks to this system they experience fewer difficulties in their activity and the results are more positive. However, the situation is not the same for Cameroonian companies that are slow to implement such a system, they have difficulty in synchronizing all their operations and this is reflected in the points of sale with some negative consequences for the companies. It can therefore be concluded that the supply management of foreign companies is more efficient than that of domestic companies and the main reason for this efficiency is the control of information flow management through a system that creates a single database for the entire company by synchronizing information from all departments of the company and which provides real-time access to all available information for decision making.

In order to measure the efficiency of these digital tools for managing information flows, the variables measuring efficiency within the supply chain defined by Halley et al, 2006 to know the degree of efficiency of digital tools within the supply chain have been used. On the basis of these variables, surveys in these companies have been made in order to find out the degree of efficiency.

Table 21: Effectiveness of the digital tools used

	Domestic Companies	Foreign companies
Achievement of cost reduction targets	*"Hmmm the costs... difficult question to answer, there are always cost even if you try to reduce them".* *"But the travel costs are still reduced, e.g. before for a simple document we moved one of our employees, but now thanks to WhatsApp and mails everything is sent quickly".* *But when you think about it these costs have gone down heinnn... now that I think about it with 100f cfa you can send an email or a WhatsApp message, so if you have to send the physical documents, the taxi costs will be more than 1000f CFA heinn... and by mail let's not talk about it ... we thank the people who have created these tools*	*"We are trying to reduce our costs, we have already managed to eliminate the costs of DHL shipment of some important documents by creating a platform called Share point where you can consult the documents with the least difficulty. Hmmm..., this is a relief for us".* *"As far as communication is concerned, then it's a firework display, Facebook saves our lives, the publications on our offers are very easy and fast since people are more and more on these social networks, we only benefit from them".* *"The announcement of the events is done through tweets and it is perfect for us as it saves us a lot of advertising and publicity costs".*
Maximizing the quality of services offered to clients	*"Our customers are not 100% satisfied, especially when they can't find the products on the shelves, but we are working on this problem and hope to solve it soon".*	*"We do our best to satisfy our customers, making their visit to the point of sale enjoyable".* *"One of the reasons why we require the barcode on all our products is to allow the customer to save time when he arrives at the checkout, he is served quickly and finally, he is not wasting time".*
Achievement of objectives in terms of minimization of delays	*"Here we don't have anything to say, it doesn't depend on us, there are road problems that make it very difficult to respect the deadlines, especially in the rainy season".*	*"The delivery times are not our responsibility, they are very long in terms of foreign supplies, baahh... it is not our fault and at this level, the best we can do is to anticipate our activities so that the length of the processes does not affect us. Considering the GPS data, we can estimate the time of arrival, at least they do not change and are updated in real-time".* *"Many operations in terms of the delivery of goods are beyond our control and depending on several parameters".*
Capacity to respond to hazards	*"We react as best as we can to a problem, even if it is difficult to be aware of certain problems in time".* *"Problems are told to us, we don't experience them at the moment they are produced".* *"When we are called to inform us about the problem we cannot give the solution on the spot, but we have to think about it before and it takes time".*	*"We are aware of our problems as soon as they occur, you know the information is sent to us directly by our partners and so immediately after a problem we think of a solution to deal with it. There is always an alternative solution when the problem is reported in time".*

Recording failures in the process	*"The problems are mainly due to errors in the manipulation of the numbers. You see last month one of our storekeepers lost a huge amount of product because he lost a sell-by date document. Imagine the catastrophe: 5 batches of products were lost because of this incident... hmmm... can you imagine how much we lost?"*	*"The problems are there, but we face them in the best possible way, thanks to the reactivity of our information system".*

With regard to the assertions made by these leaders, it can be concluded that the use of digital tools within the supply chain makes the supply chain reactive. In fact, companies that have successfully implemented these tools have the ability to remain attentive to customer needs, reduce response time, and solve problems through real-time access to information. In addition, these companies are better able to adapt to the unexpected circumstances of the environment. This reactivity is observed in foreign companies thanks to their information systems. This reactivity is one of the performance criteria defined by Mesnard and Dupond (1999), so the conclusion is that foreign companies have a more efficient supply chain. While some are more effective than others, they all meet several challenges.

4.6 Digitalization Stage of Retail Supply Chains in Cameroon

The figure 27 presents the stage of digitalization of retail companies in Cameroon. Indeed, some enterprises have already passed the digitization phase (step 1) and are already in the second stage (digitalization), especially foreign enterprises established in Cameroon. For the management of their information flow, they have already succeeded in setting up information management systems (ERP) for the internal management of the company with a centralized database to which all departments and services have access and in which information is updated in real-time. However, national companies are still in the first stage.

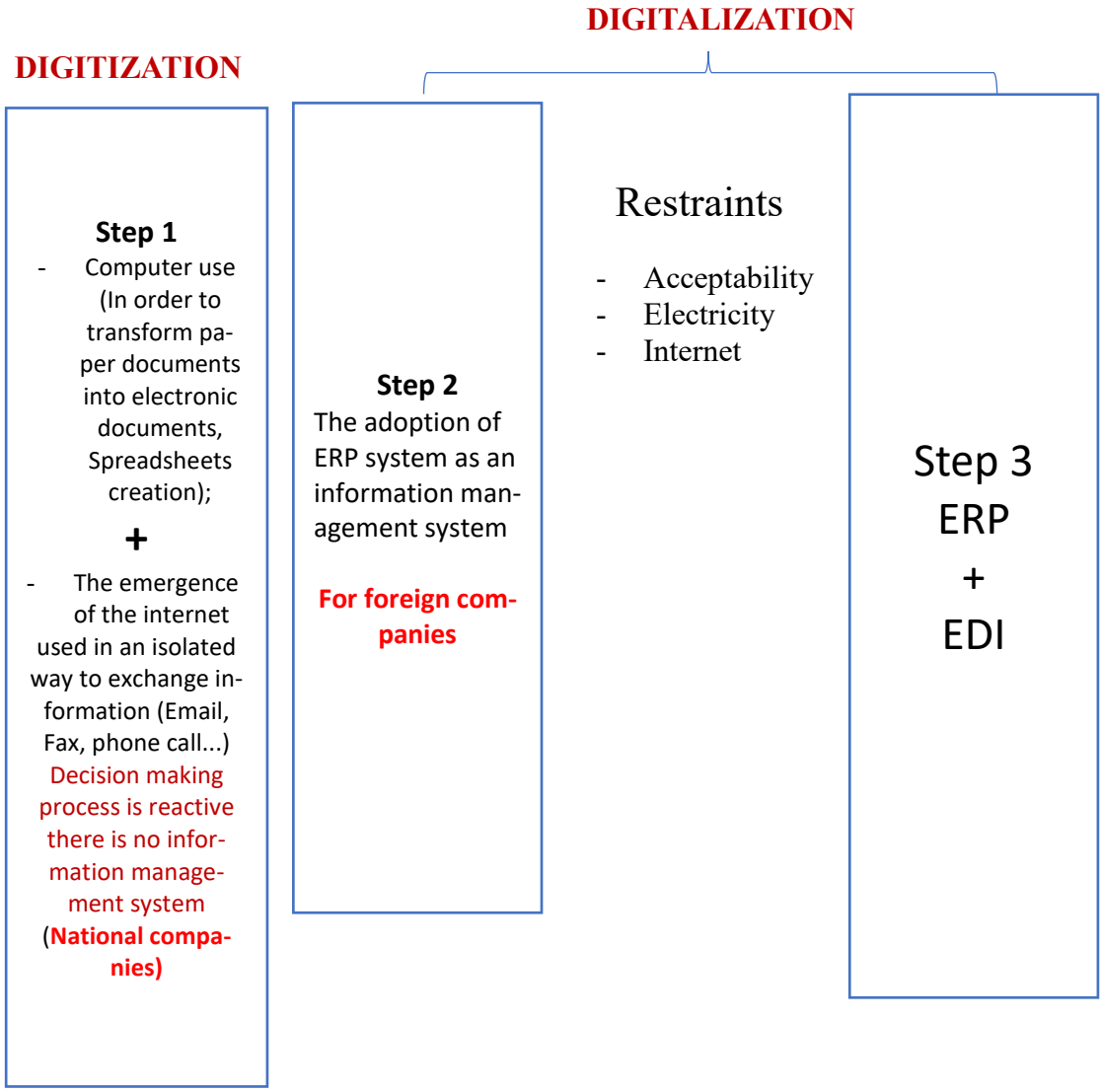


Figure 27: Digitalization stage of retails supply chain in Cameroon
(Source: Author´s own elaboration)

Moreover, even for foreign companies, the passage from step 2 to step 3 is slowed down due to certain constraints, mostly independent of the company, related to its environment. Among these constraints have: the acceptability problem of the new technologies by the employees but also by the customers, the problem of physical infrastructure, but above all the most important is the problem of electricity.

Nevertheless, companies that have managed to reach the second stage have a more efficient supply chain than those that are still at the first stage.

4.6.1 Retails Companies Situation in Cameroon with ERP System

The situation of companies that have managed to reach level 2 by implementing the Enterprise Resource Planning system has improved significantly (Table 22). It is because this system allows them to share information in real-time in order to be efficient in their decision making. Indeed, all employees have access to up-to-date information and this allows them to act on the basis of real information. These companies are setting new digital trends such as creating web-sites to present their different products and announce the introduction of a new product at the point of sale. In addition, they have also set up a digital payment system that allows customers to pay for their purchases by credit card.

However, this technology is not at all accepted by customers as the usage rate is a maximum of 5%. Nevertheless, the Enterprise Resource Planning system is proving to be effective for the management of certain activities within the supply chain. Indeed, companies using it have achieved the objective of maximizing the quality of service offered to the customer thanks to efficient stock management (stock updated in real-time and ease of inventory), companies ensure the availability of products in the linear and avoid stock shortages as much as possible. In this way, companies record fewer errors in carrying out their activities because there is no more manual data entry. However, the poor state of the physical infrastructure does not allow optimal use of these technologies.

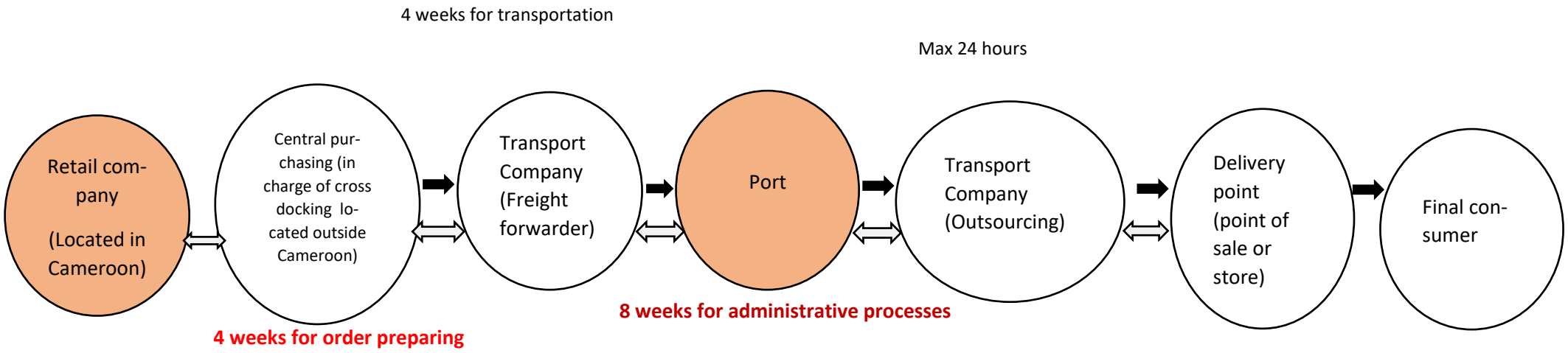
Table 22: Retail companies situation in Cameroon

Element	Transformation
Supply chain (ERP)	- Information sharing within the company in real-time; - Efficient stock management which avoids overstocking certain products
News trends in retail	- Web to-store (to give the location of points of sale, opening hours and announce new products). - Digital payment (used by only 5 % of customers)
Success factors	- The very poor state of physical infrastructure - Competences (There is talent in the fields of new technologies)
Efficiency	- Achievement of error reduction targets - Recording failures in the process - Achievement targets of the maximizing quality of services offered to the client reached

When looking at the new trend of digitalization in the European and Cameroonian retail companies, the difference is huge. In Europe, the debate is nowadays about revolution 4.0, while in Cameroon the digitalization process is in its second phase, and some companies have already reached that second phase, while others have not yet reached it. The differences can be explained by macroeconomic factors.

4.6.2 Retail Supply Chain Dysfunctions in Cameroon

Companies in the retail sector in Cameroon are confronted with dysfunctions along the supply chain. These dysfunctions occur at the level of certain links in the chain and this affects the entire chain. These problems are often due to factors internal to the company but mostly to external factors. The figure 28 presents the supply process and indicates the problematic links that should be emphasized in the digitalization process.



Supply process time 16 weeks

Figure 28: Retails supply chain in Cameroon
(Source: Author´s own elaboration)

Indeed, the players in this supply chain are as follows: Retail company, central purchasing, transport companies and the final consumer. The supply process is triggered when the safety stock is reached. The procurement department defines the quantity needed and then transmits it to the central purchasing department which prepares the order for shipment.

The preparation time is 4 weeks. Because the order is not transmitted automatically, a slip is first drawn up, scanned, and then sent by e-mail. This is when the central purchasing department contacts different suppliers. Once the order is ready, the transport process starts and the products are transported by sea. The transport time is 4 weeks.

when the products arrive at the port the administrative procedures at the port take 8 weeks. This procedure is time-consuming because the goods arrive at the same time as the documents that allow starting the administrative procedures.

Between the placing of the order and the moment of receiving the time is 16 weeks.

This time is estimated to be very long because the steps of the process are not automated and synchronized, all the steps are done manually.

In this supply chain, the flow of information is fragmented because, at each step, the information is processed at that level, it is at the end of that step that the next one can start. Indeed, each step is executed without the next one being aware that it is being processed, it is at the end of this step that the next step receives the information in order to be started. This situation prevents activities from being prepared in advance. As an example, if the departments in charge of administrative procedures had access to real-time information while the goods are on board the ship, they could start the process before the goods arrive at the port, so the procedure would not take as long to be carried out.

Moreover, the lost time is located in two places: At the level of the central purchasing office for the preparation of the order. However, this problem is not their fault, it is due to a lack of real-time information sharing between the company and the central purchasing office and also at the port of arrival, as the administrative procedures take a lot of time due to the lack of real-time communication of information when the goods are being transported.

In the process of digitizing the supply chain, the emphasis must be placed on the retail company in Cameroon and also at the port of arrival.

4.7 Conclusion and Summary of the Chapter

This chapter described and analyzed the supply chain of retail companies in Cameroon in general and the management of information flows within this supply chain in particular. During this analysis, several results have been obtained:

- The Cameroonian retail sector is dominated by the presence of local shops, traditional markets and recently retail companies have emerged and in recent years there has been a strong growth of companies due to the arrival of foreign companies on the Cameroonian market;
- Supply chain management is managed differently in national and foreign companies established in Cameroon. Foreign companies have more efficient management because they have a central purchasing office that organizes their supplies and therefore they face fewer stock shortages and overstocking. However, national companies have difficulties in the supply process because they do not have a central purchasing office, they manage more than 700 suppliers on a daily basis, which makes the supply task more complex and the consequences can be seen at the point of sale, with numerous stock-outs of products;
- In terms of information flow management within the supply chain, there are disparities between domestic and foreign companies. In fact, the analyses have shown that foreign companies have reached the second phase of the digitalization of their supply chain because for the management of their information flows they have implemented ERP systems in order to manage the internal information flow and they are already planning to take the next step by implementing EDI within the companies so that there will be an interconnection between the company and its business partners and automation of tasks. On the other hand, national companies are the first step in the digitalization process because they use computers only to send e-mails, make calculations and enter texts. Thanks to their advanced stage in the digitalization process, foreign companies are more efficient than national companies in terms of stock management, respect of deadlines, availability of products at the points of sale and also in terms of reactivity to certain situations;
- And finally, whether national or international companies are involved, there is a general malfunctioning situation which is the time of the international supply process. In fact, the procurement from suppliers located abroad is very long for both companies. This length is due to poor management of information flows within the supply chain and therefore the problem is mainly located at two levels: at the company level due to the lack of interconnection and the lack of sharing of information in real-time between the company and its

foreign partners, but also at the port of arrival level due to the length of administrative procedures.

Faced with these results, companies should accelerate their digitalization process and, as a result, the process should be accentuated at the company level, but above all at the level of the port of arrival.

Chapter 5: Elaboration of Digital Concept for Retails Supply Chain in Cameroon: Scenario Analysis and Concept Development

The supply chain is a process that takes products from the manufacturer to the final consumer via transporters, warehouses, and distributors. It is therefore considered for the most part as a fundamental physical process of goods circulation. But today the talk is about the digitalization of the supply chain because it encompasses not only the circulation of goods but also that of increasingly numerous information flows. It has therefore become an informational process, a supply chain of information exchanged from one end of the chain to the other to enable its management. In the Cameroonian context, where the traceability of the supply chain and the length of the supply process are major challenges, digitalization has become a solution to ensure traceability and reactivity.

5.1 Scenario Analysis: Digitalization by Automating Supply Process

Scenario analysis in this research involves assuming changes in the management of information flows within the supply chain using new tools and seeing the changes that the use of these tools could bring about within the supply chain.

Automation is something to be embraced by organizations and not to be afraid of (Büyüközkan and Göcer, 2018). Accuracy and responsiveness are of paramount importance in the supply chain, as a small mistake can be fatal for the whole company. Furthermore, products cross several thousand kilometers and many borders before being released at the point of sale, which is why order compliance with delivered products must be high on the list of supply chain leaders because the success of the business depends entirely on this chain management (Barratt, 2016). Thus, automation is an intelligent process whose adoption by the organization allows for the responsiveness and agility that creates the actual result of the use of digital technology.

In developed countries, many companies have already automated all processes within their supply chain, however, in developing countries, the practice has not yet been adopted because it is now that companies are becoming aware of the importance of automating the supply chain and as a result, companies in the retail sector in Cameroon are seriously considering automating their supply chain, as this would facilitate the supply process, especially for imported products,

as this solution seems very interesting because the process will become less complex and less time consuming compared to a manual procedure. This solution also avoids errors as well.

Automation is both the dematerialization of exchange media between supply chain partners, the interconnection of systems between them in an ecosystem with many actors, and a lot of information circulating. This is not easy to achieve, especially in a less developed country. To automate the supply chain, it is necessary to implement several technologies adequate for its success, which is why Kotzab (2005) asked the question of what information technologies are adequate for the supply chain of retail companies. In answering this question, he identified three technologies that are adequate for the retail industry, namely EDI, barcode, and scanning technology.

5.1.1 1st scenario: The Use of EDI by the Company

Let's consider that the retail's companies reach step 3 by starting using the Electronic Data Interchange system in their supply chain according to the "Order to Cash" principle of the GS1 international standards. Indeed, this principle stipulates that the data linked to the documents of reception and delivery in the warehouse are exchanged, controlled, and compared between the company and the supplier. The Electronic Data Interchange system has several advantages for these retail companies:

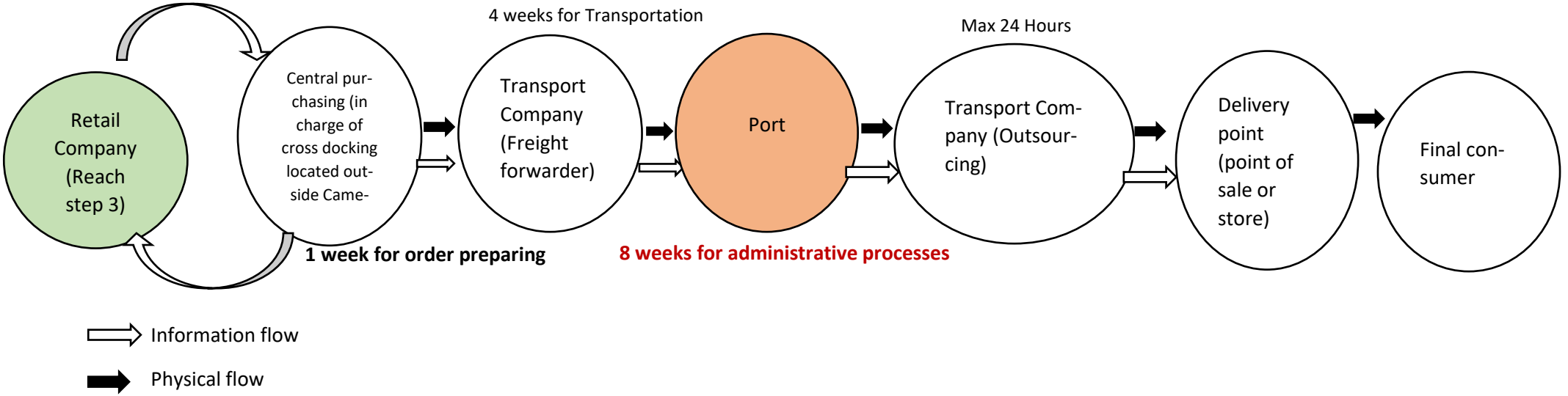
- It allows the dematerialization of documents imported in the supply process (invoice, purchase order, delivery note...);
- It allows the automation of commercial exchanges between the different partners of the supply chain;
- It improves order-to-cash cash flow;
- It reduces the disputes that could arise in different processes;
- It also reduces out-of-stock situations thanks to real-time monitoring of stock levels;
- It eliminates re-entries.

There will be an interconnection between the company and the central purchasing (Figure 29). Also, suppliers and central purchasing departments will be connected in real-time to the different points of sale of the company to react as quickly and efficiently as possible. In fact, sales in

the points of sale are transmitted in real-time on platforms that are accessible to all supply chain actors. On the side of the platform organizers, after receiving the automatically transmitted sales report, they prepare the orders to replace the products sold at the point of sale, which allows for just-in-time delivery.

The order will then be triggered when the barcode of the product purchased by the customer is scanned at the checkout. At the moment of scanning, the system will not only retrieve the price of the article to invoice the customer, but it will immediately send an order to subtract the quantity to the centralized merchandise management system. The barcode is the product identifier, as it is a unique code and no other article can bear this code.

The products are sold several times in a point of sale, through the barcodes scanned in that point of sale, as soon as the security stock is reached, the order will be automatically generated. These orders will be automatically sent through the EDI system after the obligatory fulfilment of certain conditions. The order file created by the system will contain the barcode.



Supply process time 13 weeks

Figure 29: 1st digitalization Scenario

(Source: Author´s own elaboration)

After receipt of this purchase order, the barcode is read by the merchandise management system (as this barcode will contain all the information related to the order) and the supplier will proceed with the preparation of the order in the logistic units that contain SSCC (Serial Shipping Container Code).

The goods to be shipped to the merchant will be accompanied by the delivery note which will contain information on the order, delivery, and quantities of the various products delivered.

When the goods arrive, the SSCC tags will be scanned using RFID technology integrated into the tags by the recipient's system and, thanks to the DSADV (Dispache Advice), this system will automatically record the quantities delivered and add these quantities to the shop's stock. The registration of goods received enables automatic invoicing which is called INVOICE.

The preparation of order takes less time (from 4 weeks to 1 week) because the system of central purchasing is connected to the point of sale, it can predict the moment when the security stock However, At the port the time remains the same because there is no exchange of information when the goods are being transported, all the information and documents necessary for the administrative procedures arrive at the same time as the product at the port.

Due to too long time of handling at the port, companies still face to 2 biggest challenges: Supply process time and Cold chain traceability.

5.1.1.1 Cold Chain Traceability

The length of the process makes cold chain traceability very difficult. The cold chain consists of maintaining the products at the low temperature necessary for their conservation. There are two categories of products in the cold chain. On the one hand, some require very low temperatures for their preservation, because the products must remain frozen, for example, fish, poultry, meat, some frozen vegetables. The maintenance of these different products in good condition requires a very low temperature below 0, and on the other hand, there are fresh products whose temperature must be higher than the previous category. These are products such as cheese, butter, yoghurt... In this category, the temperature must be a little higher. This category is more delicate to manage because a too low temperature can freeze the product and damage it and too high a temperature can also deteriorate the product, so it is important to find a suitable way to preserve this type of product.

Indeed, real-time temperature control onboard of transport vehicle for fresh produce is a major difficulty for companies that market these products. Normally, the temperature must be

controlled from the departure of the product at the supplier's premises to the purchase by the final consumer, i.e. from the supplier's warehouse to the refrigerators at the points of sale, via the loading and unloading points in the transport trucks. However, as far as retail companies in Cameroon are concerned, it seems very difficult to control the temperatures of products when they are kept in port for 8 weeks for administrative procedures. When the goods enter the port there is no way to remotely control the conditions of preservation of the products and to see if all the parameters are respected. This is a problem faced by companies in the retail sector. As an illustration, there are the following statements: *"The products take so much time at the port of arrival that sometimes when they arrive at our place they are further damaged, especially the fresh ones. At this moment we don't even know if the conditions of conservation are respected, obviously not. In short, when the goods enter the port it is a total blackout until they leave", "It is difficult to control the temperature of the products during their transport, so we very often encounter damage to the products". And it's a very big loss for the company because we can't sell damaged products, we throw them straight into the bin".*

Poor management of the cold chain has serious consequences within the supply chain. Indeed, a bad regulation of the temperature will inevitably lead to food poisoning due to the proliferation of micro-organisms not tolerated by the human organism. Also, it can lead to the deterioration of products, which can cause a radical and harmful change in the intrinsic characteristics of the product. Since the quality of the products offered for sale at the points of sale is a priority.

5.1.1.2 Supply Process Time (long)

The length of the supply process (13 weeks) after the implementation of EDI by the company is due to the length of administrative procedures at the port of arrival.

Indeed, the administrative procedure at the level of the port is carried out in 3 steps the first one is the one before the arrival of the goods, then at the arrival of the goods and finally the customs clearance itself. However, the pre-arrival stage is not carried out until the goods arrive at the port and the procedure begins. This is due to the lack of documentation, as the agents on the spot always require the physical documents.

Company managers complain about this situation, as can be seen from the following statement: *"And even if on our side we carry out the operations as quickly as possible it won't change much on the supply time because the major problem comes from the port, the goods spend more*

time at the port, and it doesn't depend on us, it because that their way of handling procedures is too slow".

Thus, it is clear that the digitalization process must involve all the players in the supply chain. Indeed, if only one link finds a solution at its own level and the other links are handicapped, it affects the entire chain. If the company starts to use digital solutions only at its own level, the problem will not be solved by even half, which is why the digital transformation must involve all the players in the supply chain.

5.1.2 2nd Scenario: Process Automation at the Arrival Port

Let´s consider that there is an Implementation of digital platforms (at the port) where all the information will be exchanged in real-time between all the actors involved in the supply chain; Creation of telecommuting through the implementation of the EDI system; Automation of all tasks. The duration of the administrative procedures is reduced from 8 to 1 week because the information is automatically transmitted to the port for administrative procedures when the goods are loaded onboard the ship at the time of departure since all the systems are connected so that all the operations will be carried out before the arrival of the goods, the total duration of the procurement process will then be 6 weeks. (Figure 30).

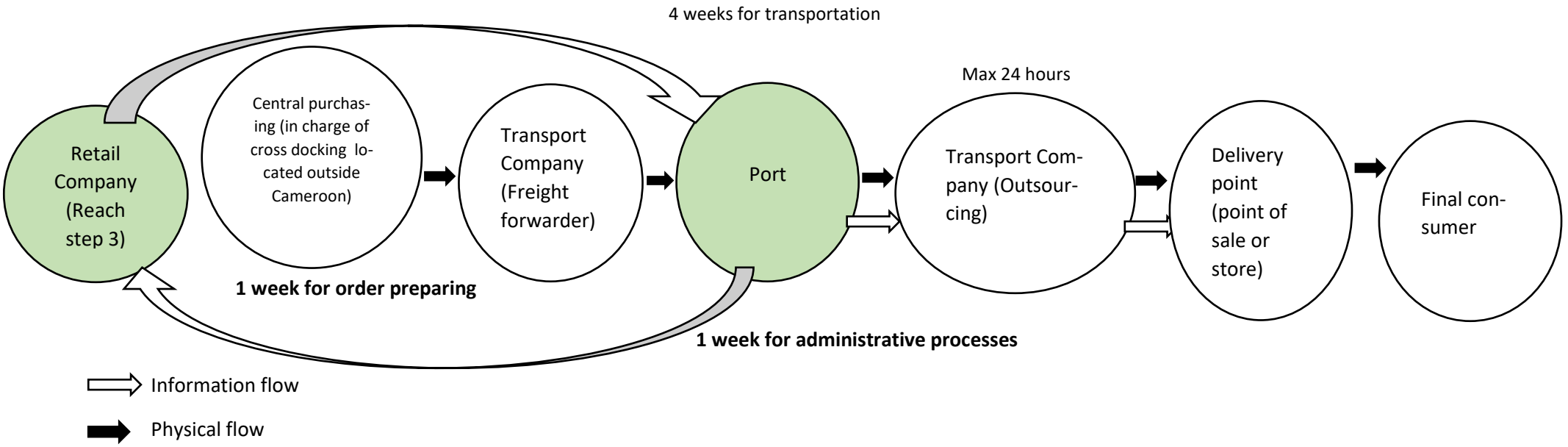


Figure 30: 2nd scenario of digitalization
(Source: Author´s own elaboration)

The automation of certain processes when importing goods is not the responsibility of the company, it is the responsibility of the GUCE (single office for commercial operation) at the port when the goods arrive, and it is also at this point that more time is lost in the supply process. This time will be dramatically reduced thanks to the automation of the processes. It used to take 40 days (8 weeks), but now it will only be 5 days, because of digitalization and the introduction of teleworking, the time taken to receive goods will be reduced from 40 to 5 days, announced Isidore Biyiha, Director of the counter, in an interview. The automation of processes in ports in Cameroon is a trend of the moment because managers have become aware of the importance of digitalization in management as the director of the counter states *"aware of the relentless role of digitalization in modern management, the single window for external operations is part of the innovative movement that enshrines new digital revolutions: IoT, Smart data, IA, Blockchain ..."*. According to him, not only would digitalization reduce transaction processing time, but it would also make it possible to secure State revenue through electronic financial transactions, but most importantly, it would reduce physical contact with people, which is a direct cause of the corruption that is very much in evidence in the field. Furthermore, digitalization makes it possible to dematerialize procedures because they can be carried out online. Digitalization is part of a process of accelerating operations and therefore saves time.

During the transport process, the traceability of the transport vehicles should be ensured thanks to the GPS installed onboard the vehicles. RFID chips should be installed on all containers during the transport of goods in order to record and transmit information during the process. Transport companies should implement transport management software (Transport Management System: TMS) that will allow the tracking of the goods by the transport company as well as by the company. This software will enable them to reduce the risk of human error through an automated process, and also the dematerialization of documents. The TMS software will allow them to communicate in real-time during the transport of the goods.

Thanks to the RFID chips installed on the containers, all the information concerning the storage status of the fresh products can be known and the company can consult them from a distance.

5.1.3 Advantages and Challenges of Supply Process Automation

In the Cameroonian retail sector, one of the advantages that supply chain automation can bring is time-saving. Indeed, by streamlining the different business processes, supply chain automation saves time by reducing the time associated with the different procedures in the case of

overseas sourcing. When all operations are automated, procurement time is reduced by more than half.

The table 23 shows the time-related data of the different supply processes within the retail companies in Cameroon in a non-automated context. To these data, has been applied the estimated percentages (obtained during the analysis from the answers of the interviews) of time reduction thanks to the automation of the processes in order to obtain a scenario of an automated supply chain.

Table 23: The scenario for supply chain automation

Supply process	**Current time (without automation)**	**% Time reduction (with automation)**	**A new time of process (with automation)**
Order processing	4 weeks	75%	1 week
Transportation	4 weeks	-	4 weeks
Administrative procedures	8 weeks	88%	1 weeks
Total	16 weeks	-	6 weeks

When looking at the table, it can be noticed that the time of the procurement process has been significantly reduced, a reduction of 63%. The time that was 16 weeks in a non-automated supply chain has been reduced to 6 weeks in the automated supply chain. This would mean that the company gains 10 weeks.

The second benefit of automation is the reduction of errors that would be associated with manual processes. Automation increases the reliability of information and allows real-time access to this information for the proper functioning of the supply chain.

The third major benefit is cost reduction: Digitize processes in the port will reduce costs by nearly 90 % (port handling costs, costs related to the expiration of products due to long handling). Supply chain digitalization optimize traceability and improve transparency.

However, the main challenge that the retail companies in Cameroon will face in the process of automation is that of the reorganization of all their systems. Indeed, reorganizing a supply system requires taking a series of complex decisions that involve the entire organization. Indeed, the decisions that will be taken must support the objectives of the organization and this requires a detailed understanding of how this affects the interactions between the different components

of the supply chain (Schmidt and *al*., 2015), this reorganization include also the difficulty of acceptance of the technology because employees are reluctant to accept new technology and also the difficulty of training these employees. It is a new technology for them and it will take a lot of effort to master the use of it. Secondly, it costs a lot to implement this technology.

5.1.4 3rd Scenario: The Opening of New Stores in Other Cities in Cameroon

The third scenario could start when the digitalization process of the port will be effective so that the time of the supply process will be reduced and it will be possible to consider the third scenario which supposes the opening of other points of sale in other cities of Cameroon such as the city of Ngaoundéré, Garoua and Maroua. This implies that the products can be replenished in a short time through an automated process.

Indeed, the city of Ngaoundéré is considered as the crossroads of Cameroon linking the north and the south. Thanks to the railway, the transport of goods will be easier and moreover many goods comings from neighbouring countries pass through this town before arriving in other cities of Cameroon. This is an advantage for companies in the retail sector to establish themselves in this city. After that, they can go to Garoua and then to Maroua in the northern part of Cameroon.

By increasing the number of points of sale, management becomes more complex and difficult, especially if it is manual. But with the digitalization of the flow of information which has been achieved through the automation of the different processes, management becomes more fluid and easier whatever the number of shops because all the processes are automatic, no more manual calculations, no more delays in the execution of tasks and above all fewer errors and more importantly the delays are considerably reduced. However, automation cannot be the only criterion when opening new points of sale in other regions, other elements must also be considered. It is of course very important for the management of a wider supply chain, but there are also some environmental criteria to be considered.

5.1.5 4th Scenario: Towards a Wider Coverage of the National Market/ The implementation of E-commerce

Once scenario 3 is achieved, scenario 4 can be implemented. This scenario is the implementation of e-commerce to cover a large part of the population. In fact, when each of the regions' main towns has a sales outlet, it will be possible to serve the peripheral areas.

Online sales are a solution for distributors to reach several consumers and facilitate the act of purchase. In the Cameroonian context, in particular, national companies wish to broaden their sales channels in order to reach several targets. For the moment the department that is preferred for online sales is the department of hot ready meals. The setting up of an online sales site requires a careful design of the site and a determination of the target audience.

Target determination

This implies that the company must determine a target on which to focus all its efforts. In this specific case, these points of sale should focus on employees of private companies and the public sector. This proposal is due to the fact they don't have much time to do shopping in the store and also as street names and house numbers in the cities are not available, it would be difficult to deliver directly to the home, as it is not possible to find the home of a person in the cities. However, when workers are targeted, their workplaces are easily identifiable and delivery can be effective. To this end, the target could be civil servants in the different ministries in the city of Yaoundé since it is the administrative city and all the ministries are close to each other, but also employees of enterprises since the address of the enterprise is clearly defined and easily identifiable. As far as the city of Douala is concerned, the privileged target will be the employees of enterprises because in this city there are many enterprises. Once this target has been determined, it will be easy to reach. Another reason for choosing this category as a target is the availability of internet connection in their place of service and therefore access to the sales site will be easy.

Website design

The design of an online sales site involves the creation of a catalogue of products,

The second element to be determined is the method of payment. The method of payment recommended to these companies is payment by telephone (Mobile Money or Orange Money), as

this is the most widespread method of payment in Cameroon. More than 50% of the population has an account with one of the operators mentioned above. This method can be preferred for payment before delivery. As for payment during delivery, payment by Cash, or telephone can also be set up. Thus, when the customer is delivered, he will be able to choose to pay either by telephone or cash (whichever suits him best).

The third element to be considered is the place of delivery. In this case, a place of delivery will be indicated on the site, it is delivered to the place of work. Indeed, the place of work is easily identifiable by the deliveryman and so he will be able to deliver directly to the customer when he has the name of the place of service and the number of the office in his possession.

The site must be designed so that when the customer provides information on the desired delivery location, the approximate delivery time will appear to him so that he will know when to order when he wishes to be delivered at a specific time.

Telephone order

Telephone ordering is a combination of two channels (E-commerce and m-commerce). In fact, these channels are complementary, to make a purchase by telephone, the customer must have the information necessary for his purchase, for example, the daily specials, the price, the telephone number to place the order... To find this information, he must visit the sales site set up by the company. Once he has all this information, he can make his call and place his order. The company must ensure that the number displayed on the site can always be reached and that the order is handled with care. When the customer makes the phone call to place an order, the person on the other end of the line must be able to give the delivery time. This time may not be exact due to unforeseen circumstances such as traffic jams or poor road conditions, but the difference between the time given to the customer and the time the customer actually needs to deliver the order should not be too great.

5.2 Elaboration of Digital Concept for the Retail Supply Chain in Cameroon

This part will provide a draft concept for the digitalization of the supply chain of retail companies in Cameroon and other sub-Saharan African countries with the same characteristics as the

Cameroonian context. The aim is to identify the needs for this implementation, the challenges that companies face and the opportunities that it can offer to businesses. This concept will highlight the needs in terms of physical infrastructure, communications according to the existing challenges, but also and above all the measures to be taken during the process of setting up digitalization for its success.

Table 24: Summary and sketch of the implementation procedure of an improved digital concept in Cameroon

Digitalization

Objectives

- Automate activities throughout the supply chain;
- Ensuring the traceability of the supply chain;
- Reduce delays in the supply process;
- Developing E-commerce;
- Automate administrative procedures at the port in order to limit human contact that can lead to corruption;
- Minimize the number of physical documents at the port;
- Implement the digital platforms at the port where all the information will be exchanged in real-time between all the actors involved in the supply chain.

Requirements

Communication infrastructures

- Improving the internet network
- popularising the use of smartphones and computers

Digital Tools

- Use of barccode, RFID, GPS
- Implementation of the EDI system
- Creation of the Big Data

Electricity :

- Government side: Investment in the acquisition, monitoring and maintenance of electrical infrastructure
- Company side: Acquisition of **solar panels**

Digital culture implementation

- Training workshops to impregnate employees
- Sensitivity campaign
- The awareness campaign could be shown on television
- Training seminars in public services
- introducing a module dedicated to digitalization in the Cameroonian education system by the government

Improve road conditions by making them more practicable (by the government)

Challenges

Acceptability

- lack of confidence in digital tools
- Fear of losing freedom in the way of working

Physical infrastructures

- Electrical Problem
- Internet network Problem
- Poor road conditions

Corruption

Opportunities

- Facilite operational process
- Automate certain tasks
- Promote the opening of new market
- Reduce corruption

Measures

- Having the competences
- Financial resources
- Ensuring security
- Technological resources

5.2.1 Objectives

Faced with the problems faced by companies in the retail sector, they have become aware of the importance of supply chain digitalization. Moreover, even in the public sector, the agents have realized the digitalization trend in some sectors of activity, namely the port sector of Cameroon, for this reason, these companies and the state of Cameroon have set themselves the following objectives:

- Automate activities throughout the supply chain;
- Ensuring the traceability of the supply chain;
- Reduce delays in the supply process;
- Developing E-commerce;
- Automate administrative procedures at the port in order to limit human contact that can lead to corruption;
- Minimize the number of physical documents at the port;
- Implement the digital platforms at the port where all the information will be exchanged in real-time between all the actors involved in the supply chain.

5.2.2 Requirements

Digitalization in the Cameroonian context cannot be achieved overnight. It requires a certain number of elements to achieve this.

5.2.2.1 Electrical Infrastructure

The problem of the electrical infrastructure is not the responsibility of the company as it depends entirely on the government. To this end, the government should ensure that the percentage of electrification of localities is as close to 100% as possible. To do this, it should first invest in the repair and maintenance of existing tools so that the localities electrified can have electricity 24 hours a day, then look for ways to extend the electrified areas to reach 100% and finally invest in the monitoring and surveillance of the installations so that they do not deteriorate quickly in order to maintain electricity throughout the country.

On the companies side, given that the electrical energy sector is in a monopoly situation, and that they do not have the possibility of using another company for electricity, it would be advantageous for them to acquire the solar panels for their own consumption. In this way, their electricity would come from solar energy and therefore there would be no power cuts that could interrupt the company's activities.

5.2.2.2 Digital Tools

In the digitalization process, of the supply chain, several digital technologies are necessary:

- ***The barcode***

Companies should ensure that all products are provided with a barcode allowing: quick identification of stock items during storage, removal, inventory, reduction of processing time, documentation and paperwork, reduction of human error and Increasing productivity by making the logistics system faster, more accurate, and more reliable.

The code has a huge impact on the retail industry. In fact, during order processing, it allows the identification of items to be kept according to their date of entry into the warehouse or shop, in order to facilitate storage and stock tracking. The information encoded in the code is decoded as it passes through the scanner and is immediately stored in the computer in order to update the inventory records in real-time.

In the distribution process, it allows the identification and tracking of the transit till delivery.

- ***The RFID***

RFID is a technology for automatic identification and data capture (Kalyanam, 2010; Chaudhari, 2019).

According to Ferrer et *al*., (2010), this technology adds value to the supply chain by acting positively on key variables: inventory, security (of products and employees), identification, product loss, traceability, automation, customization, cycle times, preparation and storage. These variables impact the key characteristics of supply chain management: quality, time, flexibility, and costs.

Angeles (2005) gives, as an illustration, the company Procter & Gamble which has improved loading speed by 40% (time), reduced loading and preparation errors thanks to RFID technology (quality), and consequently allowed a reorganization of the workforce (cost reduction).

In the process of maritime transport of products, the combination of the barcode and RFID chips allows for real-time information on the goods being transported. In fact, each individual product should have a barcode and so should the box containing a couple of products, then the pallet containing the boxes should have an RFID chip containing all the information about the pallet that should be placed on the container for sea transport. Thus, thanks to these technologies, the RFID chips will be able to communicate via the satellite even during transport and thus, it is possible to obtain the information in real-time even when the goods are being transported. These infrastructures would be very important for the digitalization of the different ports of Cameroon and thus allow to follow the shipment of goods in real-time in order to start the administrative procedures at the port of arrival at the right moment.

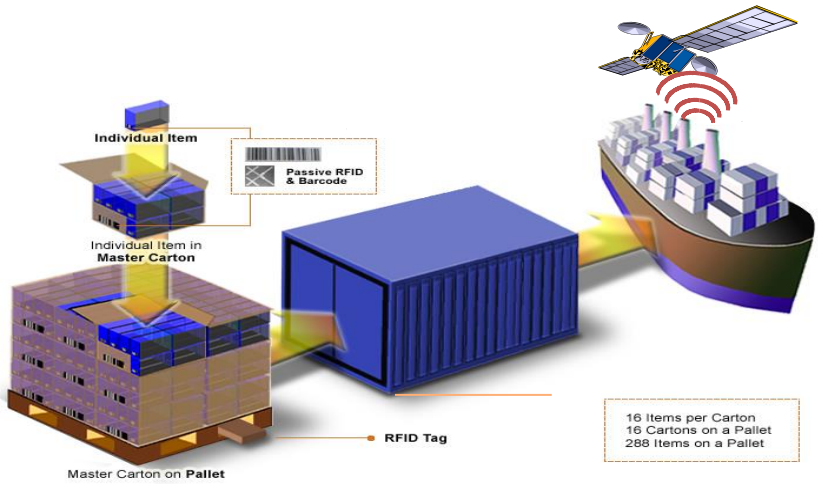


Figure 31: Illustration of the use of RFID in the Object to Object communication (Source: Haasis, 2020)

- ***GPS***

All vehicles should be equipped with GPS which should be connected to the company's system in order to be able to locate the vehicle when transporting goods.

- ***Creation of the Big data***

Data from social networks, company transactions, the information generated by connected objects on the routes of delivery vehicles, data from customers both inside and outside the point of sale, market data and changes in the business environment should all be considered to form a mega-database (Big Data) that can be used for analysis in other to obtain essential information for decision making.

5.2.2.3 Digital Culture Implementation

Companies will be impacted by the use of digital tools and therefore employees and customers as well. It should be borne in mind that Cameroonians are not necessarily used to the use of new technologies, some due to lack of knowledge and others due to lack of confidence. In order for this digital training to work and be successful, no one should be left out and all those involved in the supply chain process should be considered.

Given that the company has hundreds of employees and that digitalization does not imply a single technology, it should organize training workshops to impregnate employees in the use of these technologies, and also a sensitivity campaign could be created in order to show people the benefits of using one technology or another. In order to reach the maximum number of people, the awareness campaign could be shown on television, for example, a video showing two people, one performing a task manually and the other performing with the help of a technological tool in order to show the difference and the efficiency in the realization of these tasks.

A more advanced way of digitalization could come from the government by introducing a module dedicated to digitalization in the Cameroonian education system. In fact, there is an IT module that only shows how to use a computer, which is only the first stage of digitalization, the digitalization module could go further by impregnating the other stages until complete digitalization.

In public services, too, training seminars are needed to show employees how to use these new technologies.

5.2.2.4 Communication Infrastructures

- Improve the internet network by increasing the speed of the Internet

- Make internet access easier and more affordable
- Popularize the use of smartphones and laptops.

5.2.3 Challenges

The digitalization process of the supply chain could face many difficulties in the Cameroonian context.

5.2.3.1 Physical Infrastructures

Infrastructural challenges are independent of the company but have a significant impact on its business. In this context, these problems are those with which the company has no influence, it is obliged to operate. They are related to the road infrastructure and also to electric energy.

- ***Electrical problem***

For some years now, Cameroon has been facing electrical problems. Indeed, power cuts are regular and long. In all the cities of the country, there are always power cuts of one day, often more, but never a week goes by without a power cut. In 2019, the city of Yaoundé experienced a power cut of more than 10 days in most neighbourhoods. In the northern part of Cameroon, since September 2020, the presence of electricity has been a maximum of 12 hours a day.

These recurrent power cuts are not without consequences for businesses. All businesses are required to have a generator to take over in the event of a power cut. These generators are obviously not as efficient as electrical energy and the conservation of products therefore becomes more delicate. Moreover, these generators are not designed for frequent and long-term use. Faced with these outages, companies suffer losses in terms of products that need to be preserved thanks to electricity.

In fact, the percentage of electrification in Cameroon is around 27%, which means that out of 14207 localities in Cameroon, only 3700 have access to electricity (EcoMatin, July 2020). Moreover, the rural areas most affected are the regions of Adamaoua, the East, the North, the Extreme North, the North-West and the South-West.

The repeated cuts and the low electrification rate of localities in Cameroon makes the digitalization process very difficult. In fact, the use of digital tools requires a permanent presence of electricity because all the equipment only works with powerful and permanent electrical energy. Electricity is in a way the raw material of digitalization.

- ***Internet network problem***

The internet penetration rate in Cameroon reached 30% in January 2020, meaning that Cameroon has only 7.8 million people connected to the internet, according to a report published by Hootsuite and We Are Social, out of a total of more than 27 million inhabitants. This shows a fact rate of internet use on top of that because many localities in the country do not have access to the internet. However, for those who live in areas with internet access, the speed of the connection is slow and there are recurrent disruptions to the network.

- ***Poor road conditions***

The poor state of roads is not a matter of a city, this problem affects nearly 80% of Cameroon's cities. Indeed, this situation has a direct impact on economic activity, as almost all the roads in the major cities of Cameroon are in an advanced state of deterioration as shown in the following pictures. This state of affairs slows down the country's economic activity and seriously affects companies because of its roads, it is almost impossible for goods to arrive on time and in good condition. There are several road accidents, especially in the rainy season, and some roads are even unusable, so you have to go around and take longer paths if there are any, otherwise, you have to wait until road conditions improve and the damaged vehicles are cleared. This situation has a profound impact on the companies of the retail sector for which the respect of deadlines is essential for their proper functioning and competitiveness.

The consequence of the poor state of the roads is frequently observed in the shelves of points of sale, the products are rarely regular on the shelves because of stock shortages caused by a delay in delivery.

Figure 32: Pictures of Road conditions in Ngaoundéré
(Source: photo by Author, Ngaoundéré gare marchandise, 2018)

These images perfectly illustrate the current state of the roads and the conditions under which goods are transported.

For successful digitalization, the flow of information must match the physical flows, and for the management of the physical flows, the state of the roads is fundamental. For retail companies, the performance of the supply chain depends on the coordination of information flows associated with physical flows.

5.2.3.2 Acceptability of the Digital Tools Implemented

The problem of acceptability arises at two levels: at the level of customers and at the level of employees.

- ***Customer acceptance***

The customers of the points of sale are reluctant to use the technologies. Indeed, when it comes to digital payment within the point of sale, almost all customers are not willing to pay by credit card. This refusal is due to the following reasons:

- Lack of confidence in the system, these consumers do not consider it prudent to expose their banking data at a point of sale, because according to them these data can be retrieved by an ill-intentioned third party and used for wrong purposes. Moreover, for them, it is not a question of joking with money and exposing it in front of everyone and therefore it is better for them to pay in cash and leave no trace of the payment;
- The lack of information, in fact those who are supposed to use it do not have enough information on how this technology works. In fact, digital payment is new for them and therefore not having much information about the practice and possible consequences they have difficulty in trying it and others, on the other hand, they do not even know how the technology is used and they just prefer to pay by cash and avoid getting confused at the checkout as a customer met in a point of sale says "... *I don't know how to use the card payment and if I force myself and make a mistake, at best I embarrass myself in front of the other customers and at worst if I block my card, you know we don't play with money heinnn ....*". Poor knowledge of new technology can create unwanted or even critical situations. The use of new technology, therefore, requires a good knowledge of the technology and for this, you need to have the information likely to lead them to understand it in order to accept it;
- The security problem: In this context, the issue of security is paramount because the execution of online banking transactions is subject to many hackers. For this reason, consumers prefer to refrain and avoid any kind of inconvenience.

- ***Employee acceptance***

Within these companies, a striking phenomenon is the reluctance of employees to use technology. The reasons for this reluctance are among others:

- Lack of competence: many employees do not have the necessary skills to use new software and applications in operations management, because these tools are new to them they have not yet acquired the necessary skills;
- The refusal to change their habits. These employees were used to working without pressure and postponed their tasks because the system was not synchronized everyone working on their own without pressure hence the declaration of the interviewees: "*We were used to working without pressure and postponing some tasks for later because the system was not synchronized everyone working on our own without pressure, However, with this synchronized system, work must be always done instantaneously so that operations can take place on time. As a result, we feel that we are under pressure from the system and that we are no longer acting of our own free will, but that we are subject to the system".*

With this statement, it becomes clear that the mentality of employees towards digitalization is different from that of developed countries. These employees see digitalization as a way of depriving them of freedom in their work by imposing a work rhythm on them, unlike those in developed countries who see digitalization as a way of depriving them of jobs by having themselves replaced by machines. This can be explained by the fact that in underdeveloped countries digitalization is in its first phase and that these people have not yet realised how far the phenomenon of digitalization can go.

5.2.3.3 Corruption

The high level of corruption remains a specificity in Cameroon despite all the fight measures put in place by the government. In January 2019, according to the Corruption Perception Index report published by the NGO Transparency International, Cameroon was ranked 152nd out of 180 countries and retains the score of 25 out of 100. Indeed, one of the links in the supply chain is deeply affected by this scourge is the customs sector (Asen, 2019). Indeed, it is part of the most corrupt sector in Cameroon. As a result, this sector is very bad for traders and commerce. This situation is explained by the following statement by a trader from Germany who has difficulties in clearing her goods through customs.

"*You validate a file, then you are told there is no internet connection. You can't even take the receipt and you have to wait from morning to night and nothing is done. A big place like this... how are we going to manage these computers in the end?"* This referral was rather due to the fact that she did not give any money to speed up her case.

This situation of corruption means that the people involved are not in favor of digitalization, as this would reduce human contact and therefore certain situations of corruption. In fact, with digitalization, all operations can be carried out remotely through telework or other digital tools, which is why corruption is a hindrance to digitalization.

5.2.4 Measures

The implementation of digitalization requires certain precautions to be taken before embarking on the process.

- *Having the financial resources*: Indeed, digital tools are expensive and this means that the company needs to make sure that it has the necessary funds before starting the process.
- *Ensure the security of users of digital tools by passing laws to protect them*. The users of digital technologies must be guaranteed protection from any inconvenience caused by these technologies. Therefore, laws must be passed to protect users from problems. This precaution is the responsibility of the government.
- *Having the necessary skills to use digital tools*. Companies need to recruit talent in the use of digital tools or train existing staff. Indeed, the implementation of digitalization requires special skills in the field of information technology and therefore companies and the public sector should have people with specific skills in digital technology.
- *Having the technical resources.*

5.2.5 Opportunities

Digitalization could offer several opportunities for companies

- It could facilitate daily operational processes by allowing planning, project management and even invoicing;
- It could simplify and automate the performance of certain tasks;

- It would allow access to consumers, thus enabling data to be collected to ensure better data management in order to innovate and respond to needs and contribute to the country's economic growth;
- It could promote the opening of new markets thanks to the implementation of e-commerce, several people will be able to have access to the products without being so close to the point of sale;
- Reduce corruption as much as possible by limiting physical contact and by automating tasks.

5.3 Conclusion and Summary of the Chapter

The lesson learned from this research is that the digitalization process should focus more on people than on the implementation of technology. For it is from the acceptance of these technologies that the process will evolve. The technologies are certainly the centrepiece of the implementation of the digitalization process, but the people who use them are all the more important. Therefore, the implementation of digital culture in the mentality of people is the fundamental element for digitalization.

For academics: research should focus on changing people's mentalities in the face of new technology, so studies on people's behaviour will be more than necessary, but above all how to instil a digital culture in them.

On the practitioner's side, investment in the acquisition and implementation of technologies is fundamental, but also in the acquisition and development of skills to make the most effective use of these new technologies. Indeed, the acquisition of technology is not enough, it is also necessary to have the people capable of using it.

Chapter 6: Conclusion and Recommendation

The Topic of this thesis is the reflection and analysis of digitalization of information flow management in international supply chains of retail companies. The guiding idea of the problem concerns the efficiency of the information flow management tools implemented by the retail companies in order to control their information flow in the international supply chain. The defence of this idea lies in the concern to know if the use of digital tools for the management of information flows improves the performance of the international supply chain of retail companies in Cameroon. Due to this the research question of this thesis is how is the retail supply chain implemented in Cameroon affected by digitalization and how to improve the supply chain by using digitalization?

On the basis of this question, the objective of this thesis was to identify, analyze and understand the digital tools for information flow management implemented by retail companies, explained by those implemented in Cameroon.

As a methodological approach, the design thinking approach has been used. Indeed, the thesis started from the observation that the retail companies in Cameroon encounter difficulties in the management of their supply chain, a problem that is reflected in the different points of sale. The problems generally observed are the permanent stock shortage of certain products, but also losses due to overstocking which leads to the expiration of many products. The main cause of these failures is a lack of coordination in the management of information flows between the different partners in the supply chain (Ngoumbe, 2004). Faced with these observed failures, the main concern is knowing what are the digital tools used by companies in the retail sector in Cameroon to manage their information flow in the international supply chain. Based on this questioning, the set goal is to identify the digital tools used and answer the problem of the efficiency of these tools in the management of information flows. To carry out this study, the sample is made up of companies in the retail sector in Cameroon divided into two groups: the first group is made up of foreign companies established in Cameroon and the second group is made up of national retail companies. At the end of this study, which poses the challenge of analyzing the digital tools used to pilot information flows within the supply chain of retail companies in Cameroon, by highlighting six retail companies, results have been obtained in relation to the fixed objectives.

Three main results have been obtained in the course of this research.

Firstly, this research identifies ***the position of retail companies in the digitalization process***. It has been noticed that some companies (national companies) are still in the digitization phase, which consists of transforming analog data into digital data. However, the international companies established in Cameroon have passed the first step and are now at the second stage which consists of the use of the Enterprise Resource Planning system to manage their supply chain (Figure 27). These steps were defined after an analysis of the digitalization process of retail companies in developed countries (Figure 6). The explanation for this first result can be summarised as follows: there are two groups of companies whose use of digital tools differs from one group to another. The first group is made up of foreign companies established in Cameroon, 80% of whose information flow management is managed by digital tools:

- An Enterprise Resource Planning system equipped with different software for supply chain management;
- Internal communication platforms (share point, WhatsApp group...) which allow the different employees to communicate with each other;
- External communication platforms (Facebook and tweeter) that allow the company to communicate on its different offers;
- Digital point-of-sale management tools such as barcode scanners at the checkout and digital payment terminals.

As for the second group of companies (national companies), the management of the information flow is different because 80% of it is managed manually. Indeed, these companies use the following tools:

- Manual calculation software such as Excel and sage sari, these softwares are indeed calculation and commercial management software that require manual data entry;
- The exchange of internal information is done through telephone calls and often by WhatsApp;
- Physical documents are preferred to digital documents, which is why there are always physical files in the various processes;
- Point of sales is also managed manually in the majority of these companies as some of them do not have barcode scanners at the cash desk and at the time of payment, invoicing is done manually by entering the product reference number into the machine in order to get the price

and issue the invoice. As far as digital payment is concerned, none of the companies in the sample have a card payment terminal;

- Social media is an element used to present the company to the public.

In order to evaluate the effectiveness of the digital tools used within the supply chain, the following elements have been considered: Supply management, Shelf management, Knowledge of stock level, Delivery time. These elements have been evaluated in the two groups of companies where the degree of use of digital tools in the supply chain is very different, and then the comparison has been made. From this comparison it follows that companies that use more digital tools have a more efficient supply chain because they have a global view of their entire supply chain, thanks to these tools, information is transmitted in real-time and these companies have more control over the management of their supply chain and they face fewer difficulties in the management of their operations. Unlike these companies, Cameroonian companies have difficulties in synchronizing all their operations and this is reflected in the points of sale with some negative consequences for the companies. As for the degree of efficiency of these tools, the enterprises that use digital tools are more reactive and more efficient according to the statements made by the managers in table 21.

However, despite the observed effectiveness of digital tools in the supply chain, companies are still struggling to take the next steps in the digitalization process. This situation is the result of the main challenge faced by companies in the sector regarding the use of digital tools, hence the second result of this research.

The second result of this research reveals that the evolution of companies in the digitalization process is slowed down because of ***the problem of the acceptability of digital tools***. Indeed, the problem of acceptability is due to the mentality of employees and customers. Thus, the problem is observed at the level of employees who refuse to accept digital tools, arguing that by using digital systems they will be subjected to work pressure because the whole system will be synchronized and tasks must be performed instantly and there will be no delay in the execution of tasks. This means that they are controlled by the system and that they work under pressure. This justification is given by several of the respondents during the interviews. Concerning the customers, their refusal to accept digital tools is due to a lack of confidence in these technologies. For example, when it comes to digital payment, only 5% of customers use it at the point of sale (Table 21). In conclusion, it can be noticed that the acceptability problem of digital tools is explained on the one hand by the mentality of some and on the other hand by the lack of confidence of others.

In addition to this problem, the Cameroonian environment presents several other challenges that make the use of these tools a little more difficult. The infrastructural challenges make the use of digital tools difficult. Indeed, there is a poor road infrastructure so that the management of information flows can´t be harmonized with the physical flows; the electricity problem which does not allow the use of digital tools at all times.

The third result presents ***the process of improving the supply chain through the implementation of digitalization***. Indeed, several scenarios have been elaborated in order to show that digitalization could reduce the delay of the supply process and also solve the problem of traceability of the cold chain that these companies encounter throughout the supply chain. Thus, the Automation of the supply chain seems to be an effective solution because considering all the time reductions brought by an automated process, supply time is reduced to almost 68%.

In order to automate the supply chain, with the aim of improving it and progress in the process of digitalization, an implementation process was proposed. This process considers the objectives of the companies, the requirements in terms of communication infrastructure, physical infrastructure, digital tools, the implementation of the digital culture in order to change the mentalities. Thus, the challenges that these companies should face in this process have been identified, the opportunities and finally the precautions to be considered in the process of digitalization of the supply chain have also been identified.

In view of this work, a contribution is given related to improving the efficiency of the supply chain of retail companies in Cameroon. This improvement will be achieved through digitalization in order to have a more reactive and flexible supply chain. In fact, digitalization should not stop at the use of just a few tools and should be spread throughout the entire management of the company, because this is what the companies of the retail sector need. Finally, conclusions are that:

- *The use of digital tools improves the efficiency of the supply chain of retail companies in Cameroon;*

- *The automation of processes could reduce the supply lead time;*

- *The implementation of digitalization will solve the problem of traceability of the cold chain of retail companies in Cameroon.*

Studies in developed countries have shown that with the support of digital technologies and platforms such as the blockchain, the Internet of Things, the supply chain of retail companies

would become more efficient through large data analyses and better automatic verification (Koonce 2017; Lewis 2017; Wehberg et al. 2017).

An information system integrating ICTs will also improve communication time and reduce errors that could occur when manually manipulating different information when many stakeholders are involved (Kumar et *al*., 2016). The transformation of paper-based information exchange systems between the company and other stakeholders into electronic files will improve the accuracy of the information and ensure the reliability of the information, as scanned documents are sometimes unclear and may be fraudulent.

The digital implementation in developed countries has promoted transparency and traceability through the availability and verification of data upstream of information in the supply chain about suppliers, materials and their origin, as well as processes the manufacturing process of the finished product and downstream, transparency and traceability are beneficial to final consumers in terms of security and confidence in the company (Gharehgozli et al. 2017; Koonce 2017; Wehberg et *al*., 2017).

Through this study, this research contributes both theoretically and practically.

On the managerial level: This research was an opportunity to question the level of digitalization of the management of information flow within the supply chain of retail companies in Cameroon. Thus, it allows companies in the sector to understand the importance of the digitalization of the supply chain. The originality of this research is to make company managers understand that the flow of information within the supply chain must be done at the same time with customers as with suppliers, especially as these players possess important information. Finally, the use of digital tools in the management of information flows contributes to the improvement of supply chain performance and constitutes a competitive advantage for the company in terms of time, reliability and transparency, all of which have a value in the service offered to the customer.

On the theoretical level: this research has enabled to show the important role of digitalization in the management of information flows in the supply chain. The particularity of this research lies in the fact that it has shown that the use of digital tools in the management of information flows contributes significantly to the efficiency of the supply chain. This research has also made it possible to show digitalization in the context of developing countries that had not yet been addressed.

The recommendations will be threefold: for Academicians, practitioners and politicians.

Given that research in the field of digitalization is almost non-existent, researchers should look into the question of the need for digitalization in a context such as Cameroon, but also and above all on how to make the changes that may occur at the end of the digitalization process accepted.

The main recommendation for academics is that universities should create incubators that will bring together several students from different fields (Because the digitalization process does not only depend on the field of technology but also several other fields) and associated with companies to share experiences, difficulties and concerns. These people will have the necessary means to create, test and implement new technologies.

Companies should put in place digital tools to synchronize their information flows and their flows of goods.

- They must now invest in the acquisition of digital technologies;
- Train their staff in the use of these tools;
- To raise awareness of the company's staff and customers to accept digital tools.
- And finally, to start the process of the digital transformation of the entire company.

For digitalization to be a success in its implementation process, the public authorities should:

- Establish new regulations to protect the use of these new technologies;
- Improving the state of physical infrastructure;
- Make sure that the digital culture is implemented in the population.

However, the results of this research should be regarded with great caution and are, therefore, a work open to enrichment and criticism because, "there is no such thing as perfectly objective knowledge, i.e. leaving no room for contestation" (Blanche, 1972).

The limits may possibly lie at the epistemological level of research. The particularity of case studies generally consists of the use of documents, archives, reports, accounts and interviews. As far as the research is concerned, the particularity of this approach lies in the observation of practices carried out in points of sale but also in the management of operations within the supply chain with the aim of describing analyzing and evaluating the management the information flow in the supply process. To do this research, observations have been made alongside the decision-makers for a few days of their management methods and also to ask questions and therefore

there was no analysis of the data statistic. No software has been used, only a descriptive analysis has been made.

The cases studied are only concentrated on companies in the retail sector in Cameroon, the results obtained cannot be applied to all companies in the same sector in developing countries because the Cameroonian context presents particularities that are different from its neighbours.

The study does not give an idea of the costs that the implementation of the proposed solutions may generate.

This study could not be concluded without highlighting future axes, which will serve as flourishing prospects for research. It would be interesting to broaden the study on the analysis of the costs of implementing the digitalization of the management of information flows. Indeed, it would be important to know if the benefits obtained by the implementation of these mechanisms make it possible to cover the costs of their implementation.

It would also be interesting in future research to investigate how to implement the five pillars of digitalization and to focus on how to use them for the benefit of the supply chain, more specifically the emphasis should be placed on the creation of Big Data within these companies in order to be able to make predictive analyses and to customize the offer made to customers.

Future research could also be conducted in other sectors, such as in the industrial business sector.

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Appendicies

Appendix 1: Ranking of the 10 most influential international distributors

Ranking	Company	Points
1	Walmart	418 331
2	Amazon	288 187
3	Schwarz groupe (LiDL)	194 390
4	Aldi	185 358
5	Alibaba	164 903
6	Costco	147 202
7	Ahold Delhaize	130 918
8	Carrefour	109 201
9	Ikea	88 594
10	JD.com	86 934

Source: https://www.businessinsider.fr/carrefour-walmart-ikea-le-top-10-des-distributeurs-les-plus-puissants-du-monde-187062#10-jdcom-86-934-points

Appendix 2: interview guide

What is the process of sourcing imported products in your company?

What is the process for sourcing "made in Cameroon" products?

How is information exchanged during the procurement process (national and international)?

What are the tools used to exchange information?

Is your supply chain fully automated?

How did it implement this digitalization?

How does this digitalization work?

What digital tools are used in your supply chain to manage information flows?

What are the contributions/performance brought by the use of these digital tools within your supply chain?

What are the perceived advantages and disadvantages of using barcodes?

From the customer's point of view, has the use of digital tools changed the experience of these customers?

How do environmental factors influence the use of these digital tools? (Physical and infrastructure)

Has the use of these digital tools brought about changes in your supply chain? If so, what are these changes?

How has the use of these digital tools changed the way of working?

How do digital tools impact behaviour within the company?

What is the next step of digitalization in your company? (Within the next 3 years)

Appendix 3: Recommendation Letter

Universität Bremen*

Universität Bremen Fachbereich 07 Postfach 33 04 40 28334 Bremen

University Professor
Dr Hans-Dietrich Haasis
Chair in Maritime Business and Logistics

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Date: 13.01.2020

LETTRE DE RECOMMANDATION

Madame/ Monsieur

L'étudiante **HAPSATOU** (3242445 / 11D026EG) nationalité Camerounaise est inscrite en Thèse de Doctorat à l'Université de Bremen et à l'Université de Ngaoundéré et prépare sous la direction du Pr. Dr. Dr. Hans-Dietrich Haasis (Université de Bremen) et du Pr Victor Tsapi (Université de Ngaoundéré) une thèse de Doctorat Ph/D qui s'intitule « **Digitalization of information flow management in the international supply chain of large retail companies** »

Dans le cadre de ses travaux, Mlle **HAPSATOU** va devoir procéder à des recherches sur le terrain auprès des entreprises. Votre contribution étant d'un apport considérable et incontournable dans la réalisation de son étude, nous vous prions de lui accorder un peu de votre temps pour un entretien relatif à son thème. Bien entendu, vos réponses resteront confidentielles.

Je sais déjà que votre tâche est lourde, par conséquent je vous serais d'une grande reconnaissance pour l'accueil que vous réserverez à cette étudiante.
Avec mes remerciements anticipés, je vous prie d'agréer Madame/Monsieur, l'expression de ma considération distinguée.

Prof. Dr. Hans-Dietrich Haasis
Chair in Maritime Business and logistics

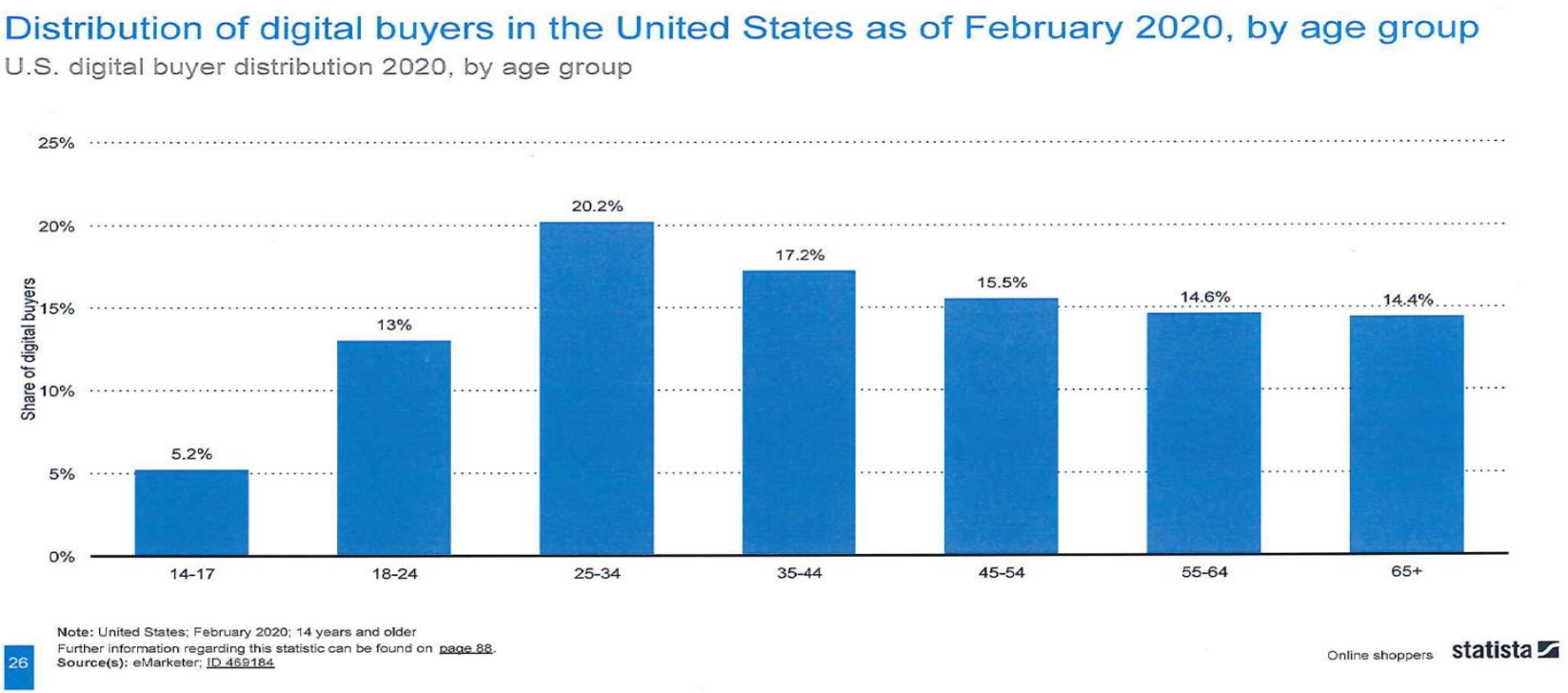
Chair holder
Prof. Dr. Hans-Dietrich Haasis

Transport connection:

Tram 6
Haltestelle: Lise-Meitner-Straße

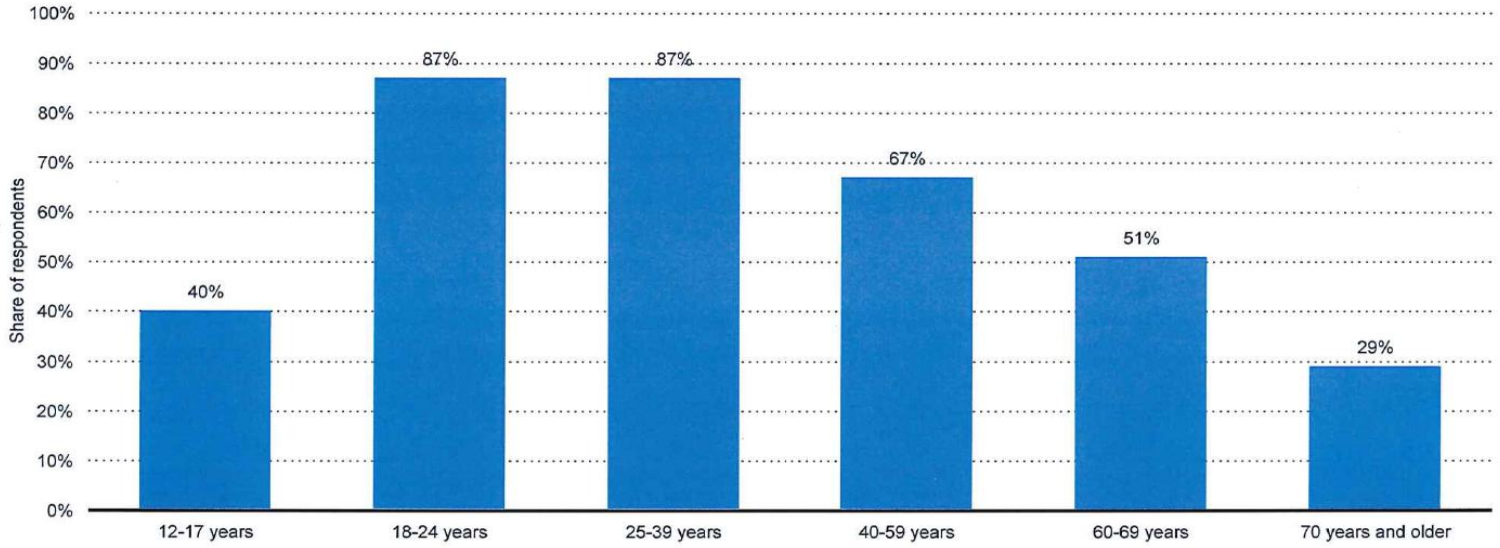
*EXZELLENT.
Gewinnerin in der
Exzellenzinitiative

Appendix 4 . distribution of digital buyer by age



Share of the population making purchases online in France in 2019, by age group

Online purchasing penetration in France 2019, by age group



Note: France; June 2019; 12 years and older; 2,259; online purchase in the last 12 months
Further information regarding this statistic can be found on page 97.
Source(s): CRÉDOC; ARCEP; Conseil Général de l'Economie, de l'Industrie, de l'Energie et des Technologies; Agence du numérique; ID 411943

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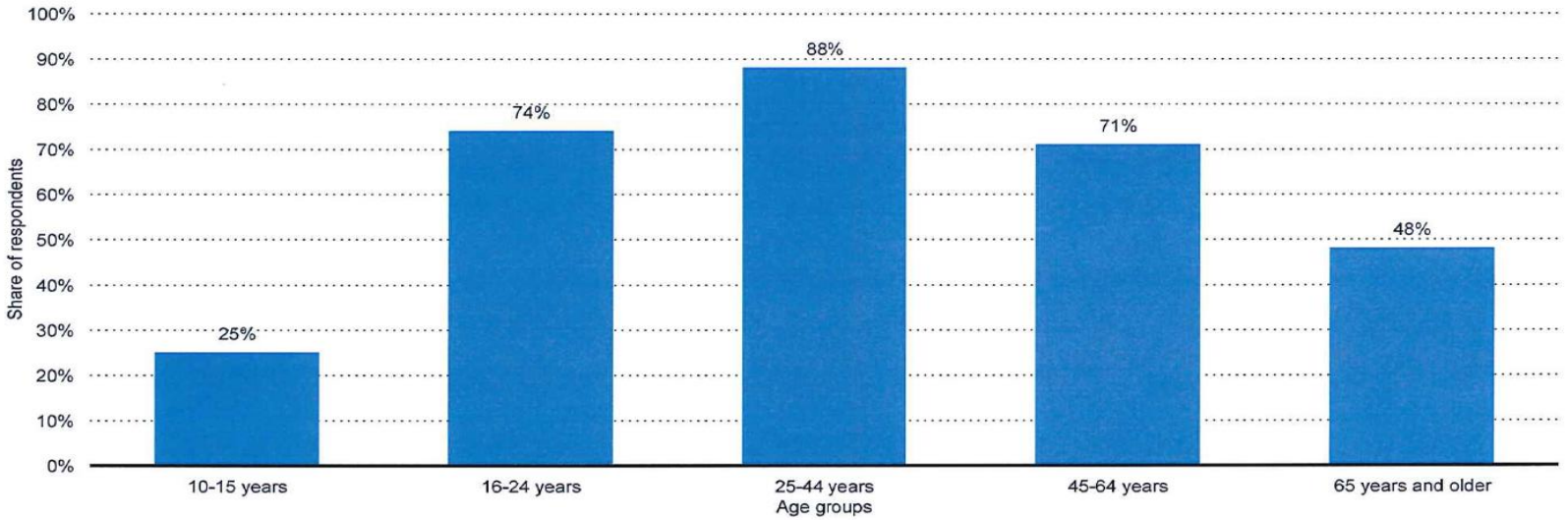
Online consumers statista

Share of internet users who ordered and purchased products online within the past three months in Germany in 2019, by age group

Share of online shoppers in Germany 2019, by age group



Note: Germany; 10 years and older; internet users within the last 12 months
Further information regarding this statistic can be found on page 71.
Source(s): Statistisches Bundesamt; ID 506181

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Online customers statista