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Innovation in the eCommerce B2c value-chain: analysis of latest trends and innovative start-ups fundings

MASTER OF SCIENCE IN
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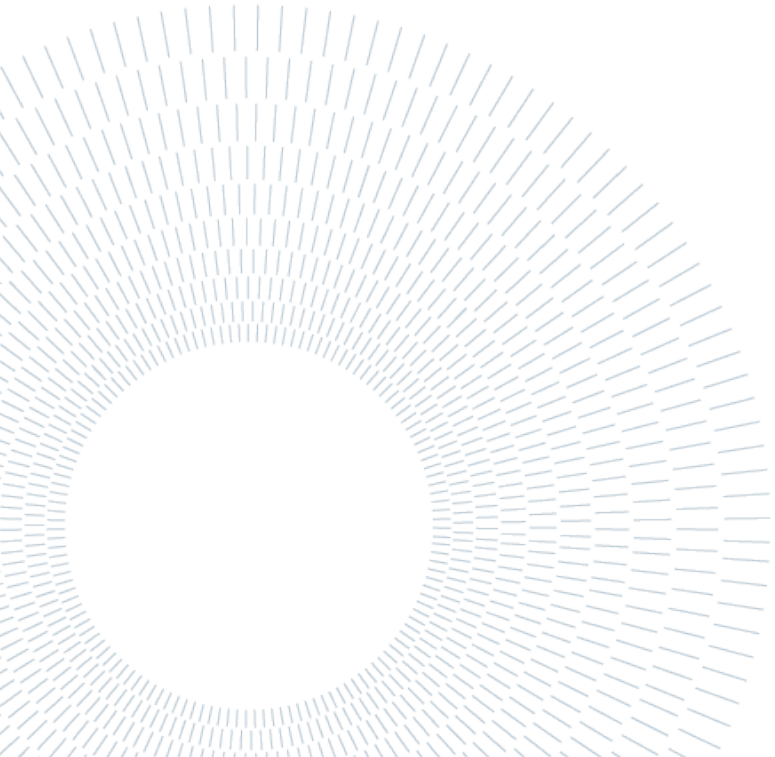


Abstract

In recent years, the retail industry has radically evolved thanks to the adoption of eCommerce systems, fuelled by changes in the customer behaviour, the spread of the Covid-19 pandemics and the influence of new technologies. In the eCommerce B2c landscape many different innovation trends are emerging and entrepreneurial start-ups can be key players in providing advanced solutions to the audience of merchants.

The research's aim is to provide a comprehensive analysis of the different innovative trends and related factors that are characterizing the present eCommerce B2c environment and its future developments. To do so, a literature review was conducted, considering 41 papers published after 2018, in which the central theme is the innovation in the eCommerce B2c sector. The study proposes a structured framework to analyse and classify each paper on eleven dimensions, providing an overview on the different innovations that are being developed to enhance the efficiency and effectiveness of internal and external processes, but also to create totally new value for both customers and e-tailers.

Finally, the research develops a quantitative analysis to understand what innovative solutions are provided by start-ups to the eCommerce B2c merchants, their impact on the value-chain, and also, to give insights related to investments flow in the different regions of the world.

The analysis is beneficial for academic researchers who explore innovative trends in the eCommerce B2c industry, managerial professionals of the retail industry, entrepreneurs who designing their strategy to enter in the sector and ,finally to investors that evaluates possible financing in the sector.

Key-words: eCommerce B2c, start-up, innovation trend, service provider, value-chain, investment

Abstract in italiano

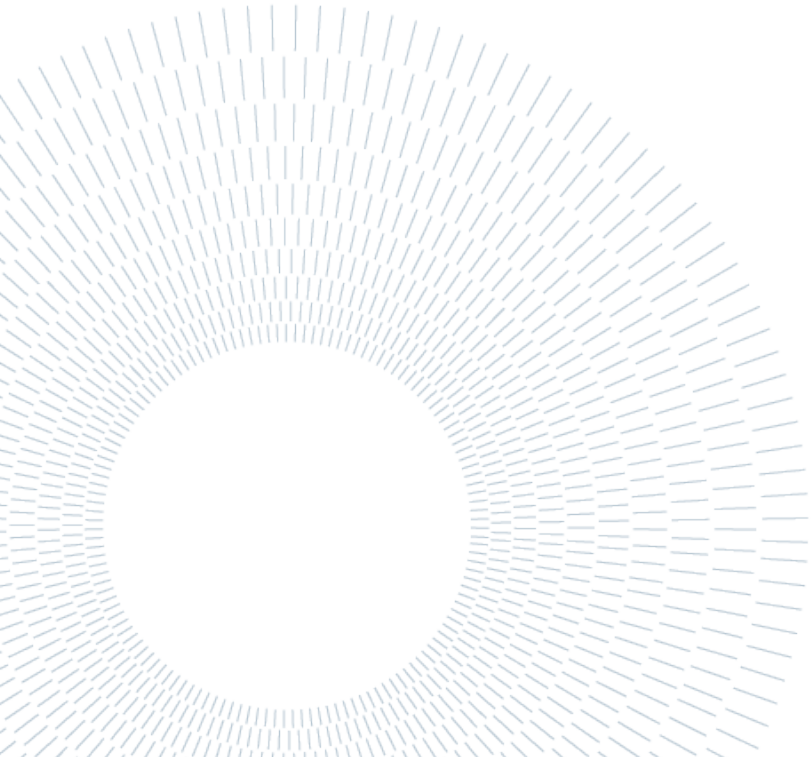
Negli ultimi anni, il settore del commercio al dettaglio si è radicalmente evoluto grazie all'adozione di sistemi di eCommerce, alimentati dai cambiamenti nel comportamento dei clienti, dalla diffusione della pandemia di Covid-19 e dall'influenza delle nuove tecnologie. Nel panorama del B2c eCommerce stanno emergendo diverse tendenze di innovazione e le start-up imprenditoriali possono essere protagoniste nel fornire soluzioni avanzate al pubblico dei commercianti.

L'obiettivo della ricerca è fornire un'analisi completa delle diverse tendenze innovative e dei relativi fattori che caratterizzano l'attuale ambiente del B2c eCommerce e i suoi sviluppi futuri. Per farlo, è stata condotta una revisione della letteratura, prendendo in considerazione 41 articoli pubblicati dopo il 2018, in cui il tema centrale è l'innovazione nel settore del B2c eCommerce. Lo studio propone un quadro strutturato per analizzare e classificare ogni articolo attraverso undici dimensioni, fornendo una panoramica sulle diverse innovazioni che vengono sviluppate per migliorare l'efficienza e l'efficacia dei processi interni ed esterni, ma anche per creare un valore totalmente nuovo sia per i clienti che per gli e-tailer.

Infine, la ricerca sviluppa un'analisi quantitativa per comprendere quali soluzioni innovative vengono fornite dalle start-up ai commercianti del B2c eCommerce, il loro impatto sulla catena del valore e, inoltre, per fornire approfondimenti relativi al flusso di investimenti nelle diverse regioni del mondo.

L'analisi è utile per i ricercatori accademici che esplorano le tendenze innovative nel settore del B2c eCommerce, per i professionisti del settore della vendita al dettaglio, per gli imprenditori che progettano la loro strategia di ingresso nel settore e, infine, per gli investitori che valutano possibili finanziamenti nel settore.

Parole chiave: B2c eCommerce, start-up, tendenze di innovazione, fornitore di servizi, catena del valore, investimenti



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1 Introduction

The rapid growth of technology in today's globalized world, in combination with the impact of unprecedented events, as the Covid-19 pandemic and the fastest rising of inflation levels in the last 40 years [1], with the continuous increase of customers' expectations, has resulted in an era of unparalleled transformations across various sectors of the economy.

One of the most profound changes witnessed, the emergence and rapid diffusion of electronic commerce, commonly referred to as eCommerce, has altered forever the landscape of economic activities as retail, industrial production, entertainment, healthcare, governmental and public activities, the financial and the service sectors.

1.1. Defining the eCommerce landscape

As reported by [2] eCommerce "*can be used to refer to any information exchange which occurs over the superhighway*" and it refers to a wide range of online commercial activities, has not only transformed informational, financial and physical transactions between different agents, but had also a revolutionary impact on customer behaviour, corporate structures, supply chain configurations and value propositions of traditional brick-and-mortar firms.

ECommerce offers a multitude of revolutionary advantages for both the seller and the buyer. Fedorko et al. [3] provides a complete overview on the benefits of eCommerce considering the retailer side and the customer side, as can be seen in Figure 1.1 and Figure 1.4.

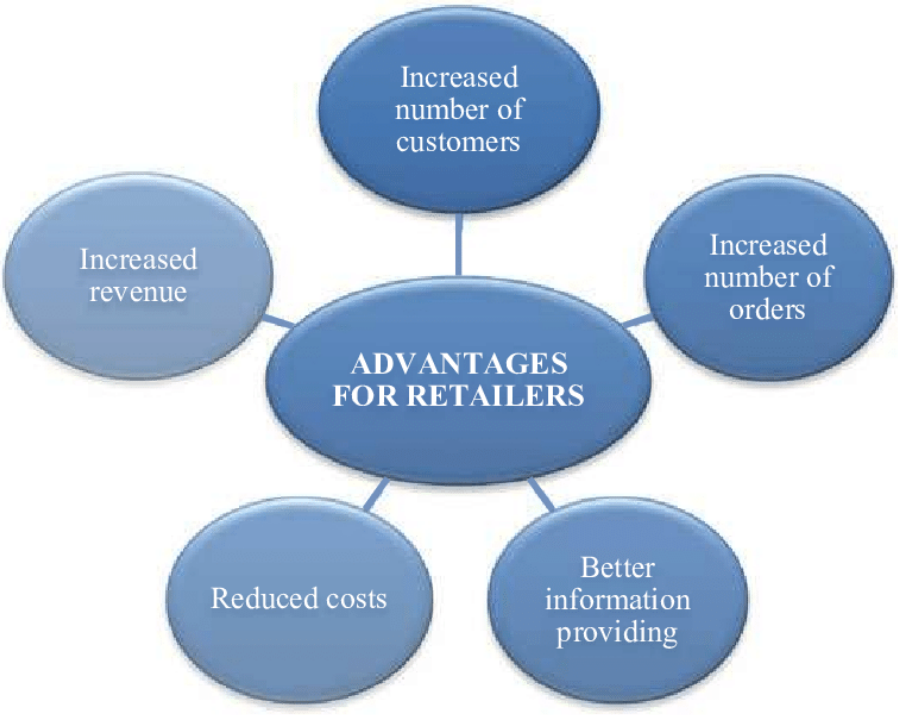

Figure 1.1: ECommerce advantages for retailers (Fedorko et al.)

Retailers' advantages are grouped in five main factors:

- *Increased number of customers*: eCommerce enables businesses to reduce geographical and cultural barriers, in fact no company has the number of stores required to have the same potential customer base of an eCommerce. Furthermore, physical stores have space constraints for what regards customers inside the store and queue formation, which can be eliminated with an eCommerce infrastructure in an easy way with an adequate IT infrastructure.
- *Increased number of orders*: the continuous availability and openness of the eCommerce model, compared to the limited time scheduling of physical store guarantee, guarantee a much higher number of potential orders. Also, the products offering can be much higher because it is not related to physical inventory spaces of stores.
- *Increased revenue*: This factor is the direct consequence of the first two, in fact a higher number of potential customers combined with an increased number of orders make revenue higher with equal prices. Often, due to increased competition in conveniency prices, eCommerce businesses have to lower their price in comparison to physical retailers; however, the effect of the first two factors outweighs the one of the price decreases. The online commerce provides retailers with a new tool to test new products or services before a future launch into traditional channel, getting feedbacks from the market without the cost of unsold inventory, because of the on-demand production or the production of a limited quantity of products and, finally, it avoids deliveries of the new products to all point of sales before knowing the feedbacks from the customers.

- *Reduced costs*: thanks to digital management of the product catalogue and of the commercial transactions, businesses don't have to spend in the physical infrastructures (mainly rent and showrooming costs), required to manage a store, and in the employees that work in it, with a significant cost reduction. The opportunity to disintermediate is another fundamental driver of reduced cost, in fact the producer can directly interact with final consumer through the eCommerce website, without the intermediation of retailer agents.
- *Better information providing*: in the online commerce companies can easily display detailed information about the products and services that they provide. Conversely, in the store information have to be communicated through store assistants, that are limited, or though printed labels, that are much more expensive to update or modify. Also, information related to customers are acquired, managed and used in a structured and value-added way. The digital identity of customers provides a series of data that can be exploited by the retailers to forecast, improve internal and external processes and personalize the purchasing experience.

All these benefits are not free of risk, in fact different researches [4] [5] [6] highlights the existence of adoption barriers to eCommerce and warning factors for businesses that wants to implement it. The main point of attention identified are related to:

- *Market extension needs a presence in the territory*: to effectively implement a global eCommerce strategy, retailers should concentrate on the development of commercial and logistic structures "in loco". This can be achieved through direct internationalization, with the creation of different business units in the different countries, or with strategic partnerships with third party service providers for marketing, operation and logistic services in the target area.
- *Respect of local regulation*: businesses must be aware and actively manage all the legal procedures and requirements involved in online businesses. In In each jurisdiction where the firm operates, there are legal frameworks controlling online transactions, data protection, consumer rights, taxation, and intellectual property rights.
- *Deep knowledge of product features*: possessing a deep knowledge of product features is an indispensable factor for effective eCommerce businesses. Local markets present unique characteristics, cultural traditions and purchasing preferences that directly influence the behaviour of the consumer and its expectations. By deeply understanding the complexity and features of their products and services, businesses can modify their goods to meet the unique demands and wants of their local customer groups. Companies must effectively communicate and promote the value propositions of their products, address potential questions or concerns, and be in line with local consumers. A facilitating example of this is reported by Beyari [2] in the case of Islamic marketing. The author states that in this case marketing and communication

become strongly ethical and features and characteristics of the products, or services, must be in line with the halal, conveying awareness and trust in the customer to make the purchase happen.

- *Development of specific competences*: the design, implementation and operating effectiveness of eCommerce models are strictly related to the presence of specific competences inside the business internal structure and key partners. In the research paper [7] the authors identify the primary business processes to effectively run an eCommerce, as reported in Figure 1.2.

Business Process	Description
Making email	Making username and password email for online shop
E-commerce registration	Making username and password online shop in e-commerce
Making online shop profile	Digitalizing the physical data of the shop and arranging the online shop profile
Uploading product	Digitalizing the physical data of product and arranging the product catalog of the online shop
Promotion	Promotion with various promotional features on e-commerce
Sales Management	Communicate with consumers, check order status and record orders received
Revenue management	Ensure the revenue has been received into the online shop account
Shipping product	Packing and shipping products to consumers
Complaint management	Discuss, provide solutions and record complaints from consumers

Figure 1.2: The eCommerce business processes (Putri et al)

For each of these processes the authors identify a series of competences or abilities that a successful retailer must develop and proposed an evaluation framework, as shown in Figure 1.3, that can be used by each business to assess the current state and program effective interventions for improvements.

No	Business Process	Competency
K-1.1	Making email	Able to make username of online shop email
K-1.2		Able to make password of online shop email
K-2.1	E-commerce registration	Able to make username for online shop in e-commerce
K-2.2		Able to make password for online shop in e-commerce
K-3.1	Making online shop profile	Able to make online shop rules
K-3.2		Able to design shop/brand logo
K-3.3		Able to make shop/brand descriptions
K-3.4		Able to display profile of the company at the online shop
K-4.1	Uploading product	Able to take product photos
K-4.2		Able to make product descriptions
K-4.3		Able to upload products at online shop
K-5.1	Promotion	Able to promote products on e-marketplace
K-5.2		Able to promote products on social media
K-6.1	Sales Management	Able to make list of frequently asked questions and answers
K-6.2		Able to explain product specification
K-6.3		Able to check the transaction status of product sales
K-6.4		Able to record data of online shop sales
K-9.1	Revenue management	Able to ensure the invoice has been paid to the online shop e-money
K-9.2		Able to withdraw money from online shop e-money
K-9.3		Able to record data of online shop revenue
K-9.4		Able to ensure the invoice has been paid to the online shop account
K-7.1	Shipping product	Able to check product before shipping
K-7.2		Able to pack product before shipping
K-7.3		Able to record data of shipped product
K-7.4		Able to confirm shipped product to consumers
K-7.5		Able to track shipped product
K-8.1	Complaint management	Able to explain complaint
K-8.2		Able to provide solutions for the complaint
K-8.3		Able to record the complaints and solutions

Figure 1.3: ECommerce competences framework (Putri et al)

- *Investment capacity*: it refers to the financial availability of businesses to invest in a variety of resources, but also the possibility to access to this type of investments, through the definition of strategical partnership, M&A activities, participation in open innovation programs and tapping into the finest global talent pools. A robust investment strategy is a required key element to establish the physical and digital infrastructures, technologies, marketing campaigns and logistic capabilities of the global eCommerce environment.
- *Ability to reach critical mass*: achieving a critical mass means ensure a substantial user base that generates a self-sustaining momentum. This is strictly related to the concept of platforms, social networks, and the impact that they have on customer behaviour and trust, that will be further explored in the next section. The fundamental takeaway is that reach critical mass and unlock networks effects are the ones with a competitive advantage in terms of organic growth in the eCommerce landscape.

Figure 1.4: ECommerce advantages for customers (Fedorko et al)

For what regards customers' advantages the researcher identifies 6 main benefits:

- *Wide range of products*: as said before, online merchants can provide a wider range of products, reducing the effort of the customers searching in different places for different products. Also, online commerce facilitates the purchase of very niche and foreign products for customers.
- *24/7 Availability*: customers can access whenever they want the products catalogue independently from the time and the location in which they are. Furthermore, they are not discouraged by long store queues and have a smoother shopping experience.
- *Discounts*: online channels provide new promotional opportunities from which every customer can benefit and use.
- *Product comparison*: the increased information availability provides customers with a much exhaustive product comparison, to make the most informed possible decision, also considering new factors as environmental and societal impact.
- *Price comparison*: eCommerce enables customers to simultaneously compare prices between merchants or manufactures that were not possible with physical presence, increasing the convenience of each purchase.
- *Saving time*: the last factor is due to the combination of the above mentioned, in fact customers can have higher time-efficiency with eCommerce transactions.

First developments of eCommerce began in the late 20th century, thanks to increasing accessibility of the internet to a wider audience. As shown in Figure 1.5, developed in the work of [8], the adoption rate of internet, over the time period between 1994 and

2007, increased in very rapid manner, becoming the primary source of information exchange in developed countries.

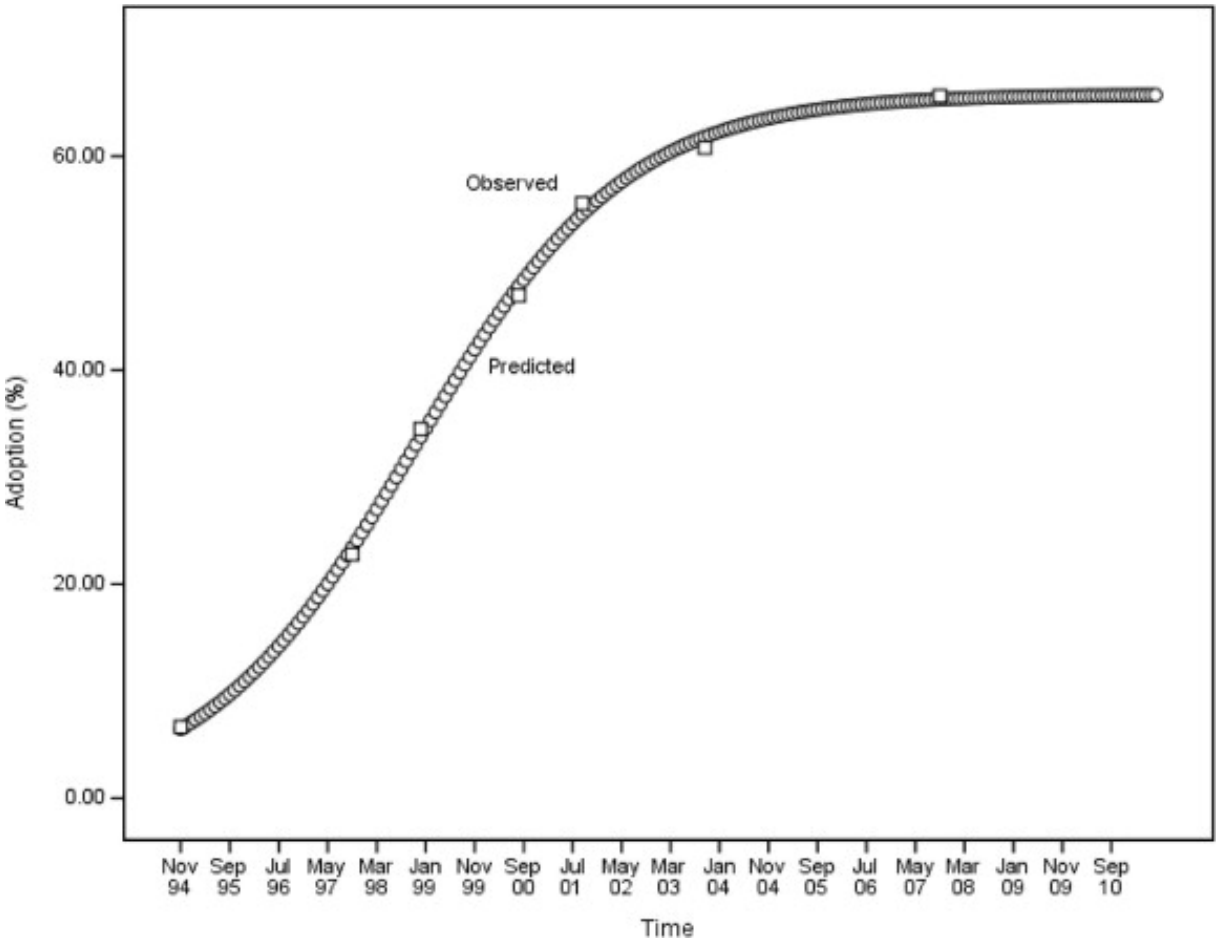

Figure 1.5: Observed Internet adoption rates over the time period (1994–2007) among individuals (Kim, S.)

Following the research of [9], the main factors affecting the diffusion of internet are:

- *Country's real GDP per capita*: it affects the purchasing power of the citizens of the country and their possibility to have access to a personal computer, to work in a highly technological company that use internet in working activities.
- *Lines per Capita*: Referred to the number of computer and phone lines per capita. It affected the physical distribution of the network inside countries and so the potential users of Internet.
- *Real Cost*: combination of the cost to purchase the computer and the cost to have access to internet connection. This factor has seen the greatest difference (reduction of cost) in the first years of 21st century, thanks to major improvements in the manufacturing of electronics components and internet network connection.

In recent years the introduction of smartphones and mobile internet as exponentially increased the S-shape curve of adoption that seemed to be saturated. Developing countries have seen the greatest impact of mobile connection, for example, as reported

by [10], Sub-Saharan countries have seen a rapid increase of mobile users, reaching 319.7 million in 2020, accounting for 27.7% of the total population, but a much lower level compared to world average of 51.2%. In accordance with the prior study, the researchers identify the internet and phone infrastructure network, here defined as broadband and home connection, as a key discriminant in mobile internet adoption. They also identify another determinant to adoption: the price of mobile internet services. In fact, they demonstrate a strong correlation between price of mobile internet services and user's adoption, in which a reduction of 5.5% of the price cause a 2.2% adoption growth.

A recent study [11], highlighted the correlation and influence of mobile internet and mobile banking adoption to the adoption level of eCommerce, studying the empirical evidence from European customers.

Therefore, can be assumed that in the future, with the continuous diffusion of internet and mobile technologies at more convenient prices and with increased connection quality, the number of users of eCommerce businesses in the different countries will shape toward the total population of them, as anticipated by [12].

Since the introduction of internet, its expansion has been exponential, disrupting the foundations of trade and industry. With the introduction of eCommerce, geographical and physical barriers have been effectively removed, allowing firms to go beyond their local environment and engage in transactions with a global client base.

In particular, previously marginalized regions of the world took advantage of the opportunities presented by digital commerce to establish themselves as primary actors in the global economic arena.

ECommerce not only enabled these countries to overcome geographical boundaries, gaining access to developed markets without losing marginality because of intermediaries, but also provided a tool for innovative local businesses to emerge as new market leaders.

This democratization of commerce has destroyed or, at least, strongly decreased traditional barriers to entry, allowing agile start-ups and entrepreneurs to improve alongside established conglomerates. The interconnected nature of eCommerce has facilitated the expansion of deep economic networks, creating new synergy and profitable collaborations across different sectors.

The latter case is particularly evident in the developing countries of the world. For example, as reported by [13] the dynamics of cross-border eCommerce have gained extraordinary traction in the setting of Shenzhen's vibrant metropolitan scene, a key centre for innovation, start-ups and corporate development. The business environment in Shenzhen, defined by collaborative relationships between several institutions, has aided the emergence of pioneering cross-border eCommerce giants such as Huawei and Tencent, among others. These businesses, which are at the

forefront of Chinese cross-border eCommerce, have made important contributions to the national and local eCommerce scene. Many disruptive advancement and structural modification of the commercial network are fuelled with cross-border activities, that accounts more than half of the eCommerce volume.

1.2. Classification of eCommerce types

As said before the eCommerce can have a very broad meaning, because it involves the exchange of information between two entities in a commercial transaction through electronic connections.

During the years different authors have segmented and categorized eCommerce through different methodologies, considering different factors as the type of transaction, the actors involved in it, the final scope of the transaction and the technologies adopted to start and finish it.

One of the first studies, conducted in 1999 by Elmer during an OECD workshop, [14] provides a framework that categorize eCommerce in three main parts based on the customer agent in the transaction and the object of the transaction:

- *B2c eCommerce*: can be also called retail eCommerce; in this model the customer is an individual and the object of the electronic transaction is a final product or service provided by a business entity. The business entity can be both a manufacturer (direct-to-consumer) or an intermediary retailer.
- *B2B eCommerce end-use*: the transaction takes place between two business entities and involves the exchange of a final product. Often in the retail environment it is referred to as wholesale commerce.
- *B2B eCommerce process*: two businesses are involved in the transaction to complete the exchange of goods or services required in the manufacturing of the final product.

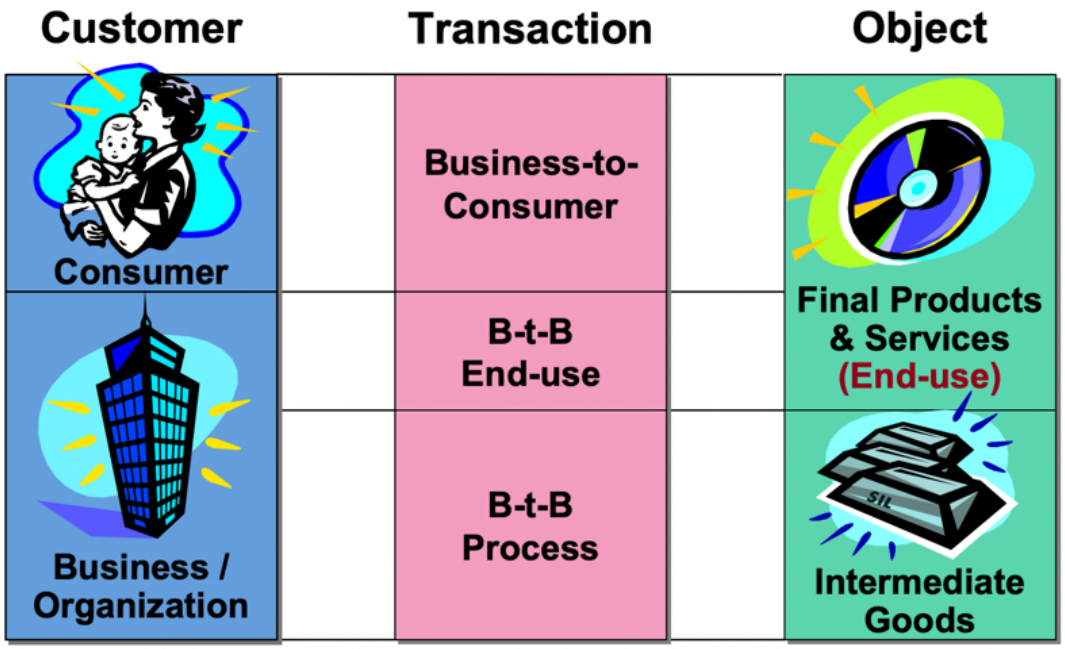

Figure 1.6: Segmentation in eCommerce (OECD)

In the same study, Elmer provides also a first framework, that can be seen in Figure 1.7, to categorize the eCommerce based on the end-use and the different stages of the purchasing process.

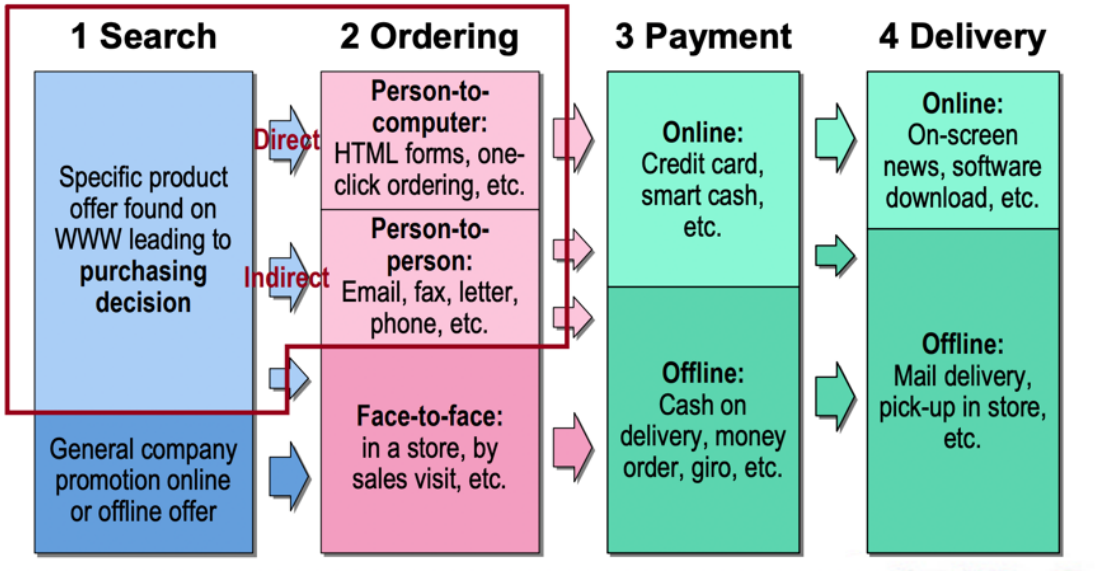

Figure 1.7: End-uses and Purchasing stage of eCommerce (OECD)

The customer journey start with the search of the product or service, which can take place with a specific search realized by the customer on the internet or through online promotion and advertising.

Elmer identifies 3 possible ways in which the ordering phase can occur after the search phase:

- *Person-to-computer:* the ordering of the product is initiated and elaborated through digital channels (for example HTML forms, one-click ordering…) without the intervention of a human being.
- *Person-to-person:* the communication of the order is provided online or through other methods (e-mail, fax, letter, phone…), but the elaboration of the order involves a human interaction to be completed.
- *Face-to-face:* It refers to traditional retail interactions, in which the customer has a direct contact with a representative of the seller and there isn't any electronic exchange.

After the ordering to have an effective completion of the transaction in financial terms there is the payment phase. Elmer identifies two possible ways to exchange the money:

- *Offline:* it refers to traditional payment methods, in which money are delivered in a physical way.
- *Online:* the use of digital financial instruments, as debt or credit cards, intermediated by financial service providers as banks.

Finally, the delivery of the product or service. This distinction is strictly related to the nature of the final product, in fact, physical products require a physical exchange, in the form of in-store delivery or outside delivery with the use of logistic service providers. Conversely, digital products, as electronic publishing and software applications, do not need any physical delivery and can be instantly accessed through electronic devices by the customer.

In the latest years, with the acceleration in the diffusion of electronic commerce in the world and its increasing use in everyday purchases, an abundance of eCommerce players has emerged [15]. With them a lot of new value propositions and business models have arisen, making the classification of Elmer only partial.

Faccia et al. [15] provided a revised classification of the possible models that eCommerce players can assume, considering the latest developments, as can be seen in Figure 1.8.

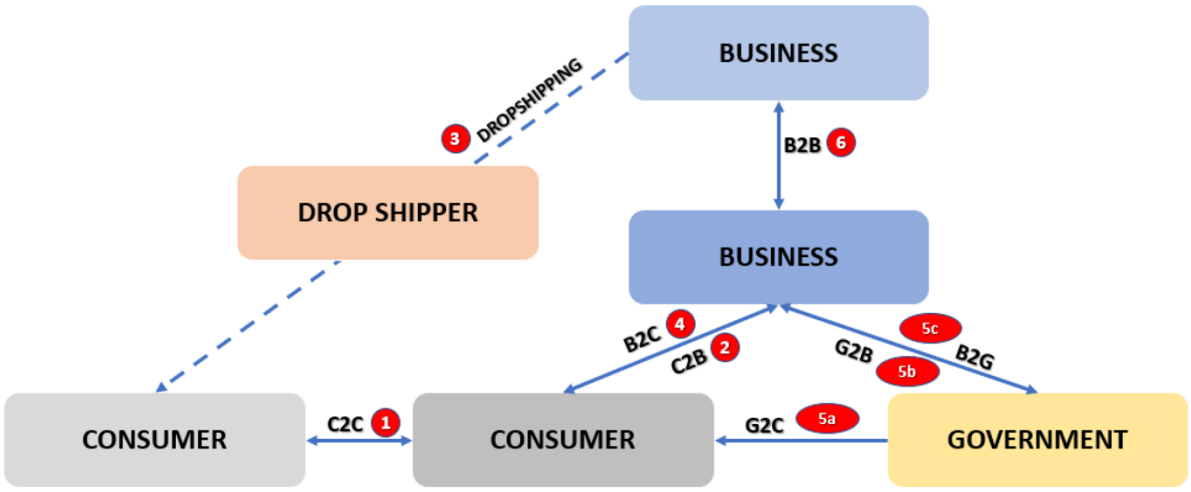

Figure 1.8: New eCommerce Models (Faccia et al.)

The new framework in which "*ECommerce models can be classified according to the legal nature of the subjects participating in commercial transactions*" introduces two new agents in the ECommerce environment: the government and the drop shipper.

The first one represents all the public institutions that are involved in commercial transactions and use eCommerce platforms (e-procurement) to engage with suppliers and to provide digital services to citizens.

The second one, the drop shipper, is an intermediate agent between the manufacturer or retailer, that physically possess the products or provide a service, and the final customer who purchase it.

Having already analysed the B2c and B2B models, the focus of the next paragraph will focus on describe the new models in the eCommerce system.

- *Consumer-to-consumer (C2C)*: it consists in the exchange of goods or services between two entities identified users. They both are identified as customers because in each transaction they can because they can be the seller or the buyer, without having an a priori role. The seller owns the rights of the product or service, having created them or having acquired them previously. The buyer purchases the product from the seller, as a traditional customer. In between the two users there is an eCommerce platform, which have the primary purpose to facilitate the transaction in different ways. From the seller perspective it provides audience-building, matchmaking, eCommerce infrastructure and core tools and services, and setting rules and standards to ensure the trustworthiness of the buyer. All these attributes, necessary to an effective commerce, cannot be accessed by a single seller independently without high start-up costs. From the buyer perspective the platform enables the access to different goods and services that in the physical retail are much more disorganized and difficult to reach. Often C2C businesses focus on the second-hand market, that in 2022 as reached a global market value of $177 billion [16], with forecast to reach a total

value of $350 billion in 2027. One of the most known platforms for C2C transactions is eBay, that self-defines as "*we create pathways to connect millions of sellers and buyers in more than 190 markets around the world*" [17].

- *Consumer-to-Business (C2B)*: in this eCommerce models individuals, like freelancers for example, offers goods or services to companies in exchange of monetary compensation or special services. In this type of model customers can negotiate with business and define custom solutions and terms. One of the most known C2B platform is Fiverr, a platform that brings together freelancers and companies, providing customers with a transparent pricing system, effective tools for managing processes and a review mechanism to reward effective professionals and ensure the reliability of their services.
- *Government-to-consumer (G2C)*: it refers to all the digital transactions between the government and the citizens, in particular the registrations of documents and access to public services through digital identity.
- *Government-to-business (G2B)*: contacts between government and businesses to enables the management of sales though public auctions.
- *Business-to-Government (B2G)*: the electronic purchase of products or services that are regulated by the law and are needed in the public sector.
- *Drop shipping*: following the definition proposed by Dennis et al. [18]: "*Drop-shipping is order fulfilment in which a retailer forwards customer orders to a manufacturer, who processes the orders and ships products directly to the end customers on behalf of the retailer. By choosing drop-shipping, e-tailers can focus more on marketing and customer acquisition without worrying about order fulfilment.*"

In addition to these categories, is also important to include the model of marketplaces, that can be included in the original framework inside the category of B2B eCommerce.

As reported by [19] an online marketplace is an eCommerce model in which third-party-suppliers sell directly to final customer through the eCommerce website of a merchant. In the marketplaces the latter facilitates the exchange, but the different aspects of the transaction, such as price, delivery terms and the customer service, are defined with a digital agreement between the supplier and the final customer.

Drop shipping is often related to the concept of marketplaces, but they are not the same thing [20]. The key difference between the two is that in the drop shipping model, the customer discovers and acquires the product from the drop shipper and pays it without interacting with the supplier, at the same time the drop shipper (or the retailer) acquire the product from the supplier in the moment of the transaction and insert the delivery information of the final customer in the supplier system or third-party-logistic provider. This highlights how the drop shipper has complete flexibility on marketing, product display and presentation, price and customer service, which are managed directly from the supplier in the marketplace model.

1.3. Key figures of B2c eCommerce

As shown in the prior sections the introduction of eCommerce models can have huge impacts and significant benefits on many businesses, altering the traditional value propositions and entire supply chains.

With the coming of Covid-19 pandemic and the related restrictions first, and with the high inflation's levels after, the eCommerce adoption increased in a strong and rapid way.

In particular, B2c eCommerce has seen one of the greatest improvements thanks to the digitalization and increase of customer purchases for both the consumer goods retailers, as fashion & accessories, consumer electronics, beauty and personal care, food & groceries, furniture and others, and the service retailers, such as hospitality companies and insurance businesses.

Conversely to the more theoretical approach of the previous sections, this section will provide a complete quantitative overview of the current state of B2c eCommerce and its impact on the retail metrics. After exploring key figures of the global context, focus will shift to the Italian setting.

1.3.1. Global context

1.3.1.1. Digital customers overview

According to the latest research on global eCommerce conducted by eMarketer [12] the number of people that purchased at least one product or service online in 2022 is estimated at 2.56 billion, 32.6% of the world population, with an increase compared to 2021 of 3.4%, corresponding to 85.5 million first-time users.

The first three countries in the world in 2022 by total digital customers are:

1. *China*: 843.3 million people, over a total population of 1.41 billion people [21].
2. *India*: 312.7 million people, with an increase of more than 100 million people compared to pre-pandemic situation, over a total population of 1.42 billion people [21].
3. *US*: 214.1 million people, over a total population of 333.3 million people [21].

The report highlights how this growth rate is the lowest recorded from the introduction of eCommerce; by comparison in 2020, with the diffusion of the pandemic, the number of new digital customer accounted to 258.3 million.

This highlights how retailers cannot continue to rely on hundreds of millions of new first-time digital buyers to drive eCommerce sales and revenues, instead they must concentrate in increasing the number of repeated purchases from existing customers and the average order value of each purchase. Marketers should also give more

attention to complementary and digitally enhanced services and understand how to profit from the huge amount of customer data that they collect.

The slowing of new first-time digital customers can be explained with 2 main reasons:

- The pandemic accelerated the eCommerce adoption by customers in all the world. A lot of people due to mobility restrictions and the fear of being infected going in brick-and-mortar stores, were almost obliged to purchase from electronic channels. This created a distortion in the adoption trend of the previous years, causing the data of 2021 and 2022 to be much lower, in relative, terms to the forecasted ones.
- Western Europe and North America registered an increase of 1.1% and 2.1% respectively, as displayed in Figure 1.9, impacting on the global results of the eCommerce adoption. The war in Ukraine, the rise of electricity prices and the following high level of inflation determined higher costs on the eCommerce supply chain, in particular in marketing, operational and logistics processes, thus bringing to reduced competitiveness against traditional retailers, a lower increase of first time customers and of the average order value [22].

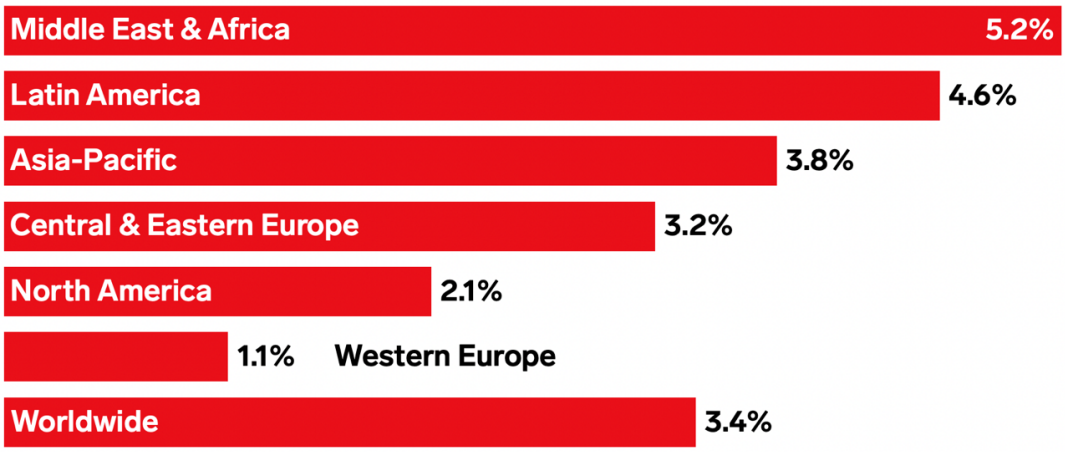

Figure 1.9: 2022 eCommerce buyers' growth by region (eMarketer)

Special attention should be paid to the development of eCommerce in Indonesia; indeed the country has been reported as the fastest growing in the world for number of new users, with an 8.8% rate.

1.3.1.2. ECommerce revenues

From a revenue perspective the eCommerce as seen an incredible growth in the latest years, as shown in Figure 1.10.

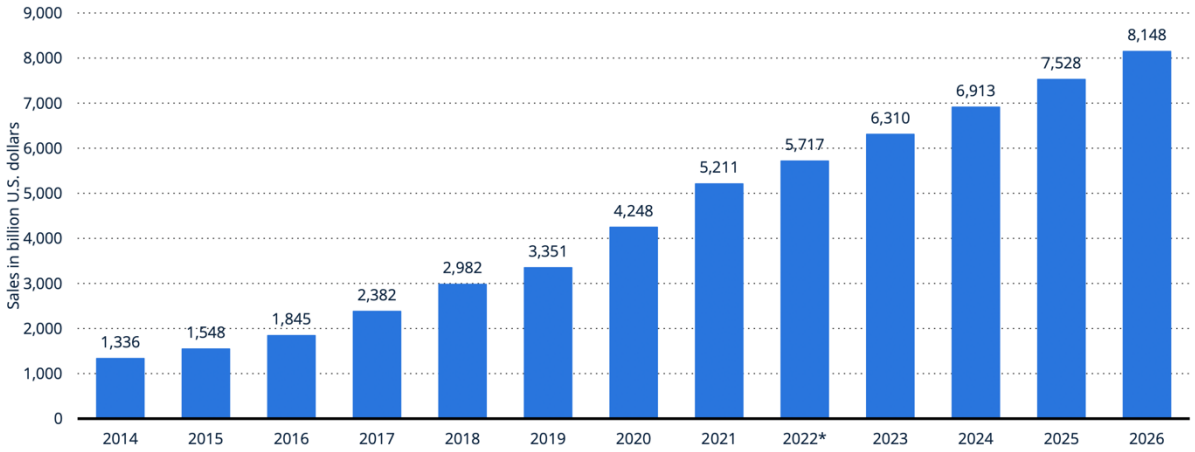

Figure 1.10: Worldwide eCommerce sales (Statista)

In 8 years, the total revenues have gone from $1.336 trillion of the 2014, to $5.717 trillion, of the 2022, with a relative growth of +428%. In 2022 total eCommerce sales grow by 9.7% from 2021. As said before, the registered improvement in sales is much lower than the one of the previous two years, characterized by global restrictions to physical retail merchants.

Until last year, worldwide ecommerce spending growth had exceeded 20% every year since the start of data tracking.

The biggest increase in relative terms is happened in 2020, due to the start of the pandemic, with a +26.8% growth compared to 2019 total revenues.

Maximum increment in absolute terms occurred in 2021, with a 963 billion rise of total sales in the digital channels.

Analysts forecast growing future eCommerce revenues, with a predicted trend lower than the levels of previous years. The expected CAGR until 2026 correspond to 10.6%, highlighting the increasing importance of online commerce in retailers' strategies.

As reported by Statista [23], comparing eCommerce sales to the total retail revenues, in 2022 they amounted to 18.9%. As shown in Figure 1.11, the share of eCommerce on total retail revenues remained unchanged in 2022 compared to 2021, highlighting equal growth in both brick-and-mortar sales and online ones.

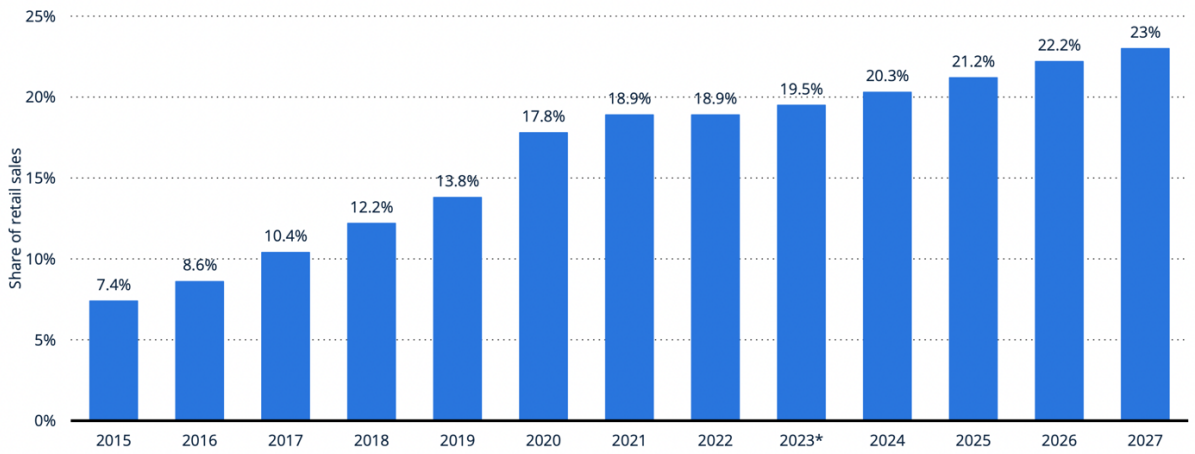

Figure 1.11: ECommerce as share of total retail sales worldwide 2015-2027 (Statista)

This can be explained with the slowing of the two biggest markets for total revenues, China and USA, and also the decrease of total ecommerce revenues in Western Europe. As reported by eMarketer latest data:

- *China*: the market has seen an increase in total sales of 6.1%, corresponding to $2.682 trillion [24]. The slowdown is the consequence of both the economic crisis, caused by high levels of debt and youth unemployment [25], that is changing customer behaviour in personal financial management, and of the complete re-opening of retail stores after almost 2 years of restrictions.
- *USA*: eCommerce transactions in 2022 equalled $1.04 trillion [26], with a net growth compared to 2021 of 8.5%, a bit lower than 9.7% global average. The return to stores combined with the 41-year record high level of inflation reached in 2022 of 7.1% for consumer price [27] determined the slowdown of eCommerce growth compared to the previous years.
- *Western Europe*: the total revenues amounted to $586.9 billion, corresponding to a net decrease of 4.5%, measured against 2021 data. The different factors as the war in Ukraine and the increase of electricity prices determined a cost-of-living crisis, reducing customers purchases. Also, after the pandemic, customers search new engaging purchasing experiences that are strictly related to stores, in particular in the fashion and luxury sectors [28].

Looking at best performers, in terms of year over year growth of eCommerce sales, from Statista 2023 data [23], it can be noticed how the majority of them are developing countries, as can be seen in Figure 1.12.

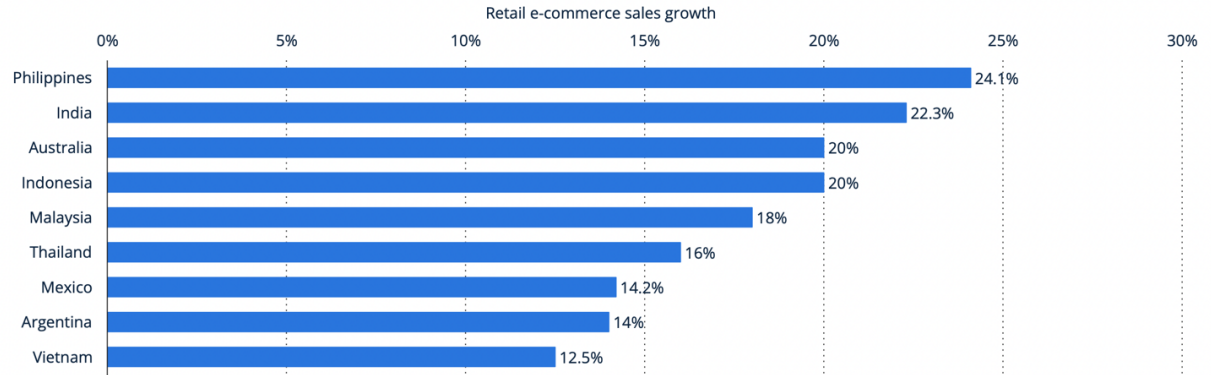

Figure 1.12: Fastest-growing retail eCommerce countries 2023 (Statista)

Four countries in the world (Philippines, India, Australia, Indonesia) have seen a growth value of 20% or more. In these regions eCommerce is seeing a strong development, mainly thanks to the diffusion of marketplaces and drop shipping modalities compared to direct-to-consumer channels.

1.3.1.3. Key global players

The number and presence of eCommerce players in the world is constantly increasing, and the biggest market shares are distributed between eCommerce platforms and marketplaces, thanks to their ability to scale-up in quickly, reaching a critical mass and consequently a dominant position.

Many of these platforms have global reach, but it can be identified a strong regional differentiation, resulting from the different development strategies of the actors. In Figure 1.13, from the latest Statista report on eCommerce [29], are showed the main businesses involved in B2c eCommerce.

Figure 1.13: Key eCommerce players by region (Statista)

Key figures and characteristics of the aforementioned companies:

- *Amazon*: is an American multinational technology company focusing on eCommerce, online advertising, cloud computing services, streaming of digital contents, and AI. It is the biggest eCommerce company in the world with $319 billion revenue in 2022 directly associated with eCommerce operations. It is

interesting noticing that directly operated online stores have seen 0% increase in in total revenues in the first quarter of 2022 compared to the prior year; instead, third party seller services (mainly marketplace function) have seen a 13% increase in the same period. The positive outlook of eCommerce revenues doesn't provide a true and complete view on Amazon current situation. In 2022 financial report [30], Amazon reported operating loss in the North America sector of $2.85 billion, compared to the net operating income of $7.271 billion the prior year. Even worst the results of the international business, in fact its results were negative for two consecutive years, with net losses of $0.924 billion and $7.746 billion in 2021 and 2022 respectively. These disastrous results were redeemed with a strong performance in Amazon Web Services segment, that passed from a net result of $18.532 billion in 2021 to $22.841 billion in 2022. But this data should be an important signal not only for Amazon management, but for the entire eCommerce ecosystem. In the report Amazon identifies different kay factors that determined the negative profitability and highlighted different risks that can impact in a strong way the business, most of them are in line with the ones identified in the section 1.1. Here the main factors identified by the eCommerce leader:

- *Intense Competition:* increasing number of competitors across geographies, both national and cross-border players. Many companies are entering the competition with new business models and value propositions. New technologies are facilitating the entrance of new firms, with price competition and the consequent reduction of margins.
- *International Operations:* internationalization of operations is a key element for the success and growth of Amazon, but in many segments the experience and presence of already present players is much higher, and this can eliminate the first-to-market advantage and so, profitability. This point is strictly related to the coherence of the business to the expectations and habits of the customers, the ability to localize the contents and the operation structure. Key factors related to internationalization are government regulation and trade protection measures in certain countries. As reported in the report, in India, for example "*the government restricts the ownership or control of Indian companies by foreign entities involved in online multi-brand retail trading activities*", and a similar problem is present also in China.
- *Demand variability and inventory optimization:* seasonality, marketing, product releases, and unanticipated events like new economic conditions, natural or human-caused disasters, harsh weather, or geopolitical events can all generate major fluctuations in demand for products and services. For these reasons is of a vital importance for eCommerce businesses to forecast with reliable results, manage the inventory and the fulfilment processes in an optimal way, reducing the

risk of overstock and stock-out for all the product categories, and a dynamic planning of shipments with logistics partners and own transportation systems without incurring in high cost or long delays that decrease the customer satisfaction.

- *Fraudulent activities of sellers:* policies and procedures must be defined in the relationship with third party sellers in marketplaces. This is evident in the Amazon case of the seller program, in which sellers are stopped from collecting payments, fraudulently or otherwise, when buyers don't receive the products, they ordered or when the products are significantly different from what the sellers described and from selling illegal, counterfeit, pirated, or stolen goods. When these procedures and rules are abused or don't work properly, there can be legal consequences on the business, with a negative return on profitability, customer trust and brand perception.
- *Foreign Exchange Risk:* the international nature of eCommerce exposes the business to financial risk related to exchange rate fluctuations.
- *Security Breaches:* Online businesses collect, process, store, and transmit large amounts of data, that is legally classified as sensitive, confidential and personal information. ECommerce players must act to prevent or mitigate data loss, theft, misuse, or other security breaches and vulnerabilities that can affect products, systems, and technologies. The risk of such information being lost or misused, could have a negative impact on operating results and lead to litigation or legal liability.
- *System Interruption:* system interruptions can make website inaccessible or with a slower usability, causing delays in efficiently accepting or fulfilling orders that impact on total sales and on customer perception of the brand. So, it is fundamental to add both hardware and software infrastructure to limit the occurrence of these problems.
- *Failure to hire and retain highly skilled professionals:* to run a business like Amazon are necessary a variety of competences inside the firm, from the managerial ones to the technical skills in the field of advanced technologies, marketing, laws, operations and logistics. Even low-skilled workers are highly required for the smooth running of day-to-day operations and the success of the company.
- *Supplier relationship:* the relationship with suppliers is fundamental to manage the different aspects and services involved in the eCommerce supply chain, from internet service provider to firms to which outsource part of the fulfilment and logistic processes. In these cases, single-source strategies can lower the cost of the service, but highly increase the dependence from one partner and the risk of total interruption of operations in case of problems. Contrary, multi-sources strategy can increase the flexibility of operations with higher impact on costs.

  - *Investing and acquiring companies:* this point highlights the importance of effective investments for organic and inorganic growth. Investments in technology, people, processes and new businesses is fundamental to continuously fuel the competitive advantage and create new opportunities.
- *Walmart*: is the largest chain in the world in the large-scale retail channel, mainly focusing on North America markets. From the latest financial data [31], the retailer has recognized to its online segment total revenues of $82.1 billion, with a 12.2% YoY increase, with a homogeneous increase in the USA, international markets and a strong increase in the subscription-based services.
- *Mercado libre*: is the most important marketplace for consumer goods in South America, it offers both fixed price and online auctions modalities to purchase products. Total revenues in 2022 amounted to $10.54 billion, with a net YoY growth of 49%.
- *Jumia*: is the key player in the African eCommerce market, it directly sells to final customer and provides both marketplace and technological services to other retailers. In 2022 the company reported $66.5 million in revenues.
- *Flipkart*: is the reference player for the Indian market, characterized by a strategy highly focused on mobile commerce, that is the most used channel of Indian customers. In 2022 its revenue equalled $7.7 billion, with an 18% increase.
- *Shopee*: started as a C2C eCommerce platform in 2015 it evolved in a hybrid model with B2c offering. It is the key eCommerce provider in the South-East Asia, serving fats-growing markets like Indonesia, Malaysia, Thailand and Vietnam. 2022 annual revenues were $7.3 billion, up 42.3% from the previous year.
- *Rakuten*: is the main actor in the Japanese context, providing not only eCommerce marketplace and services, but also other digital services and operation outsourcing. In 2022 registered domestic eCommerce revenues of 797 billion Yen. In recent years the company is actively engaged in M&A of international companies and foreign investments to pursue an internationalization strategy.
- *JD.com*: It is the second biggest Chinese player, and third in global rankings. It focuses on B2c online commerce and in the latest years has invested in high-tech technologies and possesses the largest drone delivery system, infrastructure and capability in the world. In 2022 JD.com earned $151.7 billion in revenue.

1.3.1.4. Cross-border activities

As said in the section 1.1, B2c eCommerce enabled customers to purchase made from the website of a national store independently form the origin country, enabling cross-border ecommerce. The general levels of cross-border eCommerce are still relatively

low in the global context, but some countries are exploiting new market possibility offered by the elimination of geographical barriers.

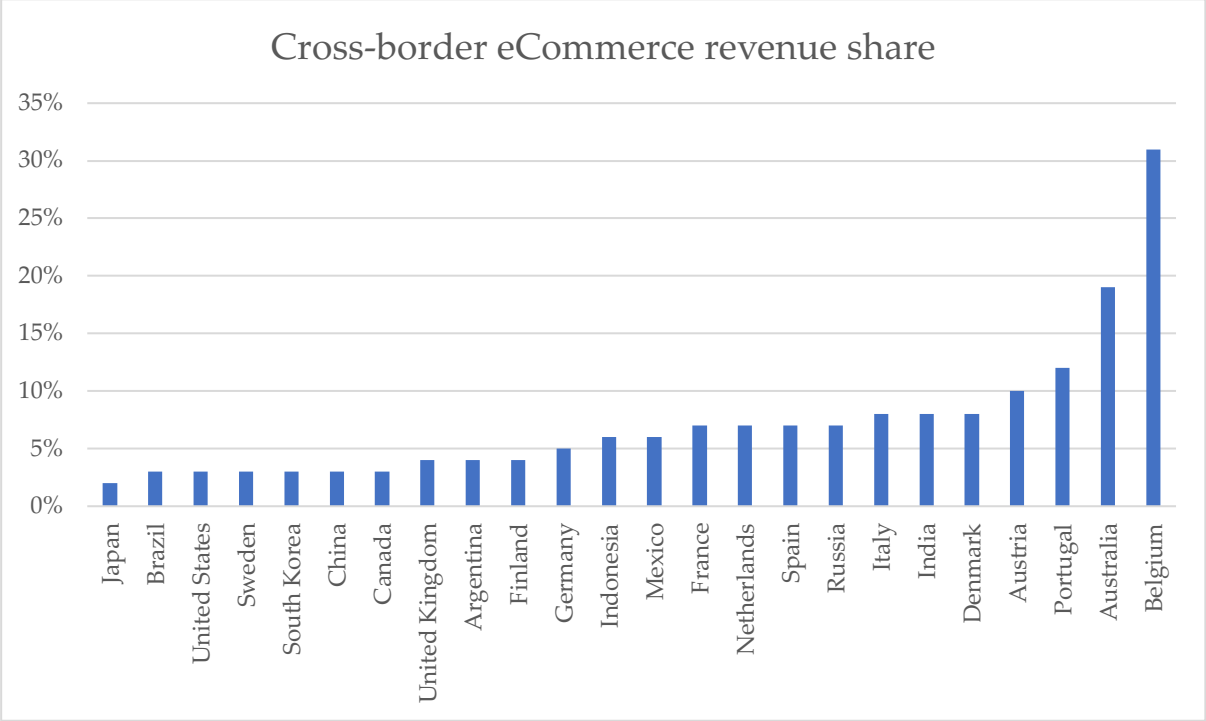

Figure 1.14: Cross-border share on total eCommerce revenue in 2022, by country (Statista)

As shown in Figure 1.14 only 4 countries in the world had eCommerce cross-border activities with an impact equal or higher to 10% of the total eCommerce sales.

Belgium, first in the ranking, saw significant cross-border activity, with big foreign eCommerce businesses taking a piece of the Belgian market; cross-border sales accounted for 31% of Belgian eCommerce net sales.

Possible factors for Belgium's high rate of cross-border online shopping include the country's cultural heritage and geographical location. France, for example, shares geographical limits with Belgium and French is the official language in the country, these elements fuel commercial interactions between the countries.

On the contrary, consumers in USA preferred to purchase locally, with cross-border transactions accounting for just more than 3% of eCommerce net sales, attracting visitors and buyer from all over the world to purchase products that are not accessible in international markets.

1.3.1.5. Sectorial perspective

From a sector perspective, latest data from [29] shows interesting elements about eCommerce impact on different product markets:

- *Electronics*: inside this category there are both consumer electronics (TV, phones, PC and similar) and household appliances (refrigerators, washing machines, kitchen and other small appliances). In 2023 the electronics segment registered

total sales of $837.2 billion, being one of the most mature segments for eCommerce adoption. Often this segment is characterized by the search online purchase offline phenomenon, but retailers are introducing new ways to recognize and attribute these types of sales to online channels, and pure eCommerce players are offering services such as free-delivery and installation to acquire new customers. Marketplaces are the preferred choice in this segment, they enable customers to compare a very broad product selection, understand key features in a quick way and read other users reviews to make a conscious and rational choice, that is the primary factor for this type of products. An exception to this market is Apple, the US company in fact is trying to adopt a direct-to-consumer model, favouring own channels over third-party ones, like marketplaces, to effectively manage and have control over the customer experience and continuously increase the brand perception. Apple gone from 29% of sales attributed to DTC in 2018, to 38% of 2022 [32]. For what regard future forecast, the Electronics market will have an estimated global CAGR of 14.6%, mainly driven by China (+19%), with Europe (+6.4%) and USA (+4.8%) lagging behind.

- *Fashion & Accessories*: inside this category there are apparel, footwear and accessories (watches and jewellery, eyewear, bags and others) products. In 2023 Statista reports total revenues of $768.7 billion, with China, $265.5 billion, Europe, $177 billion and USA, $163.7 billion, leading the world's ranking. In this sector the direct to consumer strategy is increasingly gaining importance, in particular in the luxury segment, with many consolidated brands and new digital-first brands concentrating their efforts in creating unique online experiences for their customers , such as tailored suggestions and styling, on-demand personalization and limited edition releases, as reported in the McKinsey "*State of Fashion 2023*" [33]. At the same time there are many concerns about the profitability of direct-to-consumer fashion eCommerce, in fact higher revenue margins, direct access to consumer data insights for decision making and better customer engagement that establishes brand loyalty, can be offset by rent and labour cost, worst contractual conditions with services providers compared to the ones of marketplaces and spending in digital advertising to promote the proprietary channel . Future forecasts expect the segment to reach a total of $1,103.3 billion in 2027, with a corresponding CAGR of 9.45%, with accessories as the fastest growing category and apparel as the biggest one. Europe is expected to beat both USA and China in growth terms, with a CAGR until 2027 of 10%.
- *Furniture & Home décor*: inside this category there are kitchen and home furniture, lamps and lighting and floor covering products. In 2023 reported total sales were $236 billion. Market size in the main regions was: $90.38 billion for USA, $54.57 billion for Europe, and in the third place, China with a total of $45.79 billion in eCommerce sales. The sector is characterized by a high level of

customization of products and an high number of possible configuration for a single piece, for this reason eCommerce is a good suit for the sector in particular for the research and discovery of different product variations, that in physical stores are often not available, due to the big dimensions of the products and the related rent and inventory cost, and have to be explained by store assistants in a difficult way. These types of products are often really expensive, in particular if compared to fast fashion and grocery products, so new payments methods like buy-now-pay-later are increasingly spreading in both physical and online stores. Future forecasts expect the segment to reach a total value in 2027 of $357.7 billion, with an expected CAGR of 10.8%.

- *Beauty, health and personal care*: inside this category there are beauty (cosmetics, fragrances and accessories), personal care (bathing, shaving and oral care), household care (detergents, cleaners and paper) and health care products (analgesics, vitamin, skincare and similar). ECommerce revenues in 2023 totalled $377.1 billion and personal care products accounted for 54% of it. The market is still in an early stage of development, but it is one of the most attractive for eCommerce businesses. The main reason is the high potential of automated, or semi-automated re-purchase of this products, due to their nature and use, and because of the gaining traction that subscription programs are seeing in the sector [34]. Overall, the sector is expected to be characterized by "premiumization", with a growing pace of the premium segment, compared to the base one, particularly in the beauty sector. A key role in the sector is conducted by social media and influencers, that promote healthy lifestyle suggestions and products inspiration for customers in an engaging way, as demonstrated by an Accenture customer survey [35] that revealed "*nearly six out of 10 social media users say they're likely to watch a livestream on beauty and personal care*". In the next years the sector is expected to grow at a good pace of 11% until 2027.
- *Food & Beverage*: inside this category there are all the packaged food and beverage products. The total revenues of the sector in 2023 are estimated at $520.90 billion, with the food segment counting for $330.4 billion (63.4%) and the beverage segment counting for $190.5 billion (36.6%). This online sector is one of those with the lowest penetration rate, that in 2021 in the USA was estimated at 11.87% of the total food & beverage revenues, with much lower levels in other countries. The potential of the market is therefore enormous, and forecasts say that until 2027 expected CAGR will be of 19.4%the biggest of all the sectors analysed. The main obstacles to the final diffusion of the eCommerce in the food & beverage sector are related to the high frequency of the purchase of small value orders and the consolidated presence and strong network of physical groceries, that at the moment are more convenient in terms of price and often even time compared to digital channels.

In Figure 1.15 are showed the summarized eCommerce revenues (in $ billions) of the five industry sectors analysed.

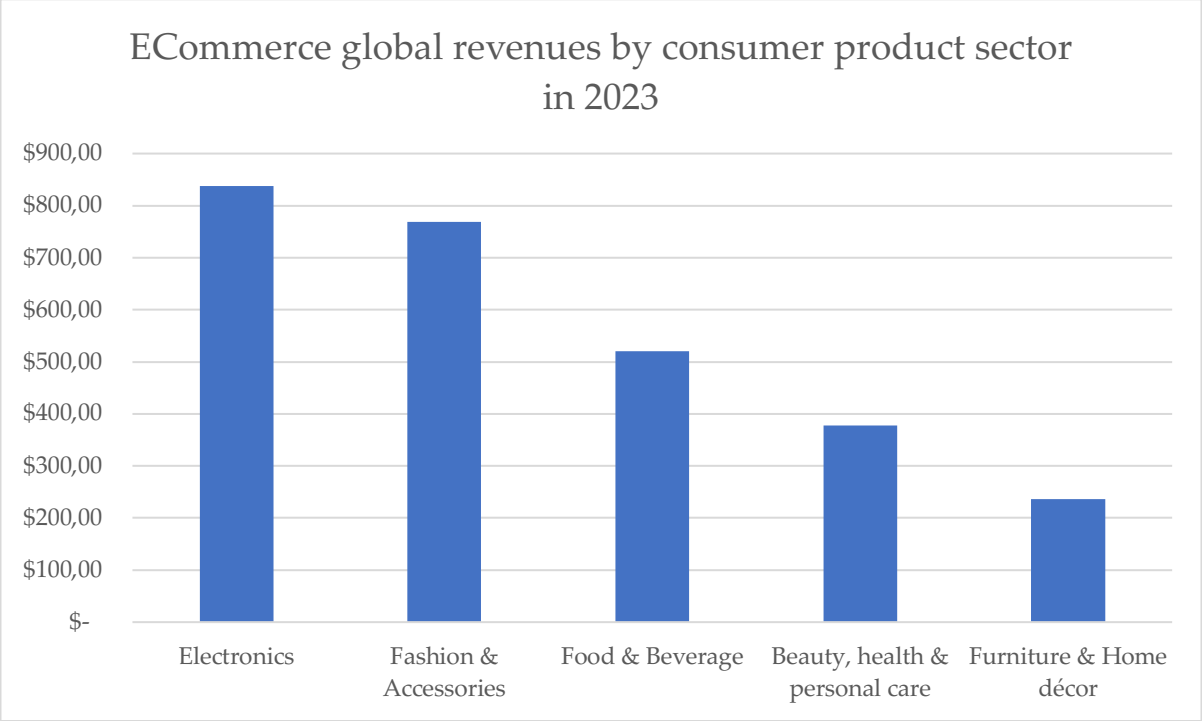

Figure 1.15: ECommerce global revenues by consumer product sector in 2023 (Statista)

For what regards the B2c eCommerce for services, the two main segments are online travel and meal delivery.

Due to the Covid-19 outbreak, the travel and tourism industry has recently undergone a very difficult period, in which a lot of businesses closed even with financial help of local governments. The series of lockdowns, limitations, and health hazards made travel to other nations impossible for people across the world, decreeing the industry as the most affected by the pandemic. As reported by Statista [36] the market, composed by 4 main categories (Hotels, Package Holidays, Vacation Rentals, Cruises), is starting to recover from this shock, returning to pre-Covid levels, and in 2023 it is

expected to exceed 2019 revenues with a total of $854.7 billion, as can be seen in **Error! Reference source not found.**.

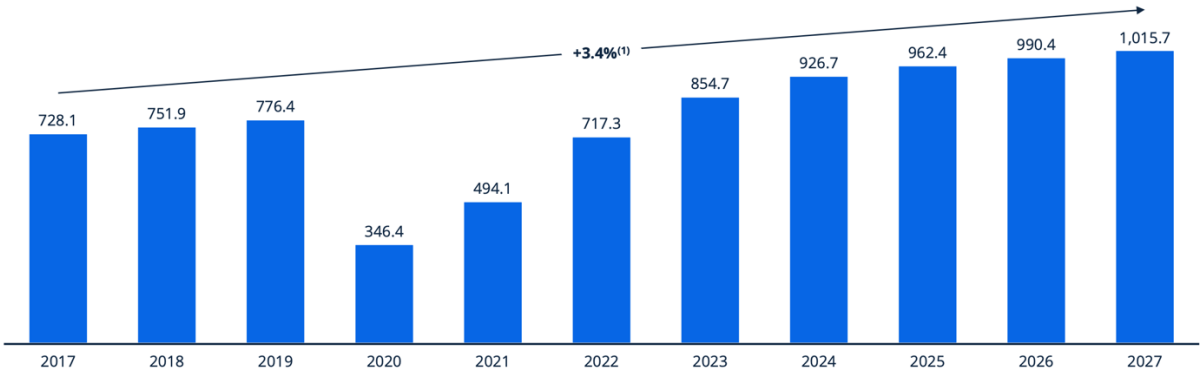

Figure 1.16: Travel & tourism revenue by year (Statista)

People were able to save money during lockdowns because traveling wasn't an option, and they now want to use that money for trips and vacations. This behaviour is referred to as "revenge travel" because the markets have since reopened.

In addition, the gradual return to in-person events, instead of full-online modalities, and the new flexible ways of working, have also driven back people to move for work.

The eCommerce presence in the sector is very high, with 68% of the sector total revenues attributed to online channels, as can be seen in Figure 1.17

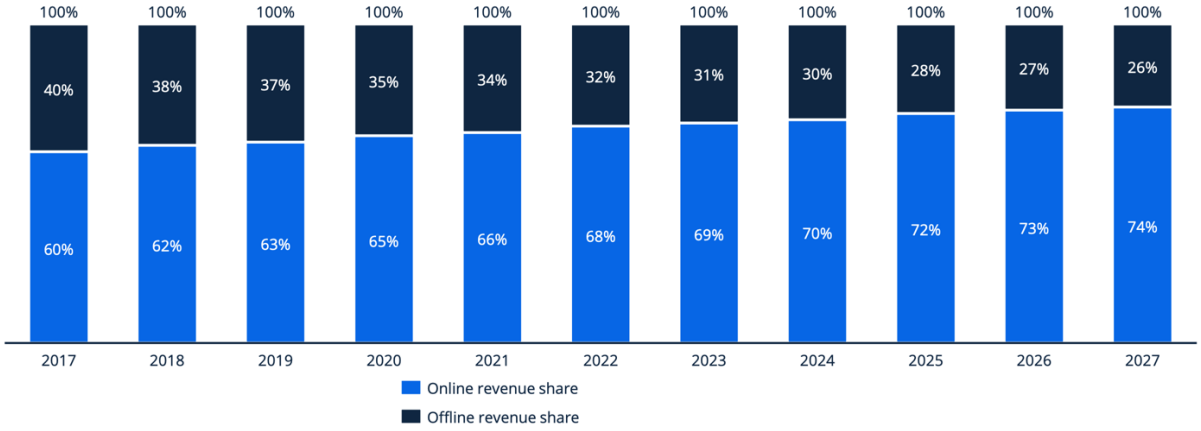

Figure 1.17: Online revenue share of travel & tourism sector (Statista)

The share of eCommerce channel will continuously increase, with an expected share of 74% in 2027. The sector was one of the first to introduce internet technology and adopt eCommerce as a new sale channel, this is related with the nature of services, in fact services are enjoyed by customers without the need of a logistic process. The customer discovers the different possible destinations and the related hotels and activities, in the past only with the help of physical travel agency or going directly to the source of the service (the hotel or the provider of the activity), these modalities resulted in high expenses, limited choice and very low possibility to plan in advance. Online commerce changed the paradigm, enabling single customers to plan and book,

from their home, structures and activities all over the world. This was also very impactful on hospitality businesses, in fact now they can promote themselves, offer in advance additional services, de-intermediate in the booking phase, optimize prices based on demand and customer characteristics and receive booking money in advance or have guarantees of the payment, thus taking advantage of the overbooking, following yield management methodologies.

The dominant players in the sector are totally different from the ones of the product segments seen before.

According to 2022 Statista data, in the first place for total revenues there is the travel platform Booking.com, that has as reference market the European one, with $17.09 billion (+13.4% compared to 2019), it also holds the record for number of website visits in 2023, with 614.1 million visits.

Following the leadership of Booking.com, there is the travel platform Expedia Inc., with total sales in 2022 of $11.67 billion (-3.3% compared to 2019). The reference market of the business in the North America. In addition to the reduction of revenues, there are strong concerns related to the profitability and long-term sustainability of the platform, in fact in 2020, with the outbreak of Covid, the company registered net loss for $2.612 billion, when the best result in the last ten years was of only $764.5 billion in 2015.

In third place there is the travel platform Airbnb, that enables both individuals (C2C) and businesses (B2c) to rent out their homes, structures or parts of them, to travellers on a short-term basis, and recently it also added "experiences", to allow the booking of complete vacation package. The total revenue of the platform in 2022 were $8.4 billion, with an outstanding 74.6% increase compared to 2019.

In the online meal delivery, the market is divided in platform delivery, in which the customer purchases the meal from a delivery app and interact only with it, and restaurant delivery, in which the purchase is done through restaurant first-party website and or app, or through online marketplaces in which the contact is between the customer and the restaurant and the platform facilitate the transaction.

In the last years, this market was characterized by the emergence of a disruptive phenomenon called "gig economy". In the gig economy restaurants and other businesses entrust third-party intermediaries (like Uber Eats and Just Eat) to conduct the delivery process of an order. As reported by [37], the difference between gig economy platforms and professional service companies is the type of relationship between couriers and the service company. In the case of professional service companies, they own delivery resources, like electric bicycles, scooters and other equipment, and the employees are recruited, trained and hired with a fixed salary and a dependent contract. Therefore, it is able to control and organize its workers and guarantee a fixed service level and delivery availability. For what regards gig economy platforms, the couriers are independent self-employed workers who offer their

services through the platform. The resources and equipment are in charge of the worker and the availability of couriers is not fixed and guaranteed, impacting on the service level and the price of the service for the customer, in a supply-demand model.

Looking at total market size from the 2023 data provided by Statista [38], total revenues are expected to be $357.6 billion, having seen an exponential growth from pre-pandemic situation, that in 2019 accounted to $164.7 billion, +117% in 5 years.

From a geographical perspective the bigger market is China, with $151.8 billion, instead Europe and Rest of the World are expected to be the fastest growing, with an expected CAGR until 2027 higher than 8%, as can be seen in Figure 1.18.

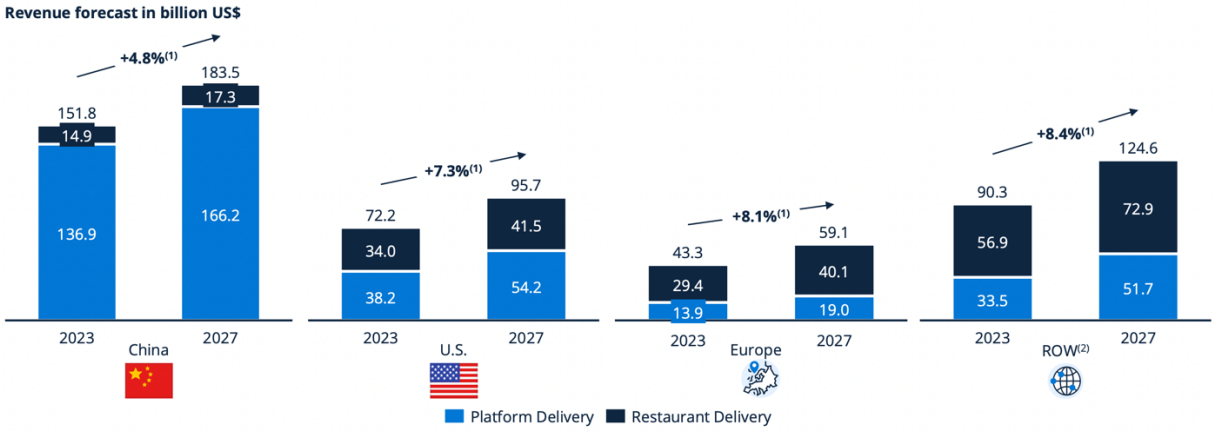

Figure 1.18: Total revenues of online meal delivery sector by geographical region (Statista)

1.4. B2c eCommerce innovation and new technologies

As reported in the previous sections, from its introduction, the eCommerce is ever evolving in new business models, new geographical markets and product categories. Innovation is a key element in the development and expansion of online commerce, in particular in the D2C segment.

1.4.1. Innovations landscape

As reported by different researches [39, 40, 2, 15, 41] many innovations impact the entire eCommerce value-chain, both from a front-end and back-end perspective; in fact, companies leverage new technologies and business models to improve the customer experience, reduce expenses, and create additional value streams by establishing a more efficient, responsive, and responsible operations and supply chain system.

As reported by Shen et al. [39], businesses investments in new technologies range from 1.6% to 10% of the revenues, in the case of the fashion industry they equal 1.8% of the total revenues, a low level if compared to other segments, but there is an increasing focus from top management on the development and use of new technologies, with forecasted investments in 2030 corresponding to 3% of the total revenues.

The application of developing technologies in operations and supply chains can provide a firm with two types of benefits: internal benefits from operations and supply chains and external benefits from consumers.

Minimizing environmental and social risks in supply chain activities, new technologies can contribute to increased sustainability and transparency. The creation of a digitalized supply chain, built on new technologies, produce a large amount of data, which, in combination with cutting-edge analytical techniques, can be used to develop predictive models, understand eCommerce supply chain interdependences and improve the decision-making processes with an increase in operational effectiveness and flexibility.

Reinartz et al. [40], proposed a framework, that summarizes the impact of digital innovations in the retailing value-chain through new sources of value-creation for the customers. As can be seen in Figure 1.19, they identified five key sources of value at firm level and correlated them to the perceived benefits of customers.

The five sources of value creation are:

- Automation: the elimination of human need in back-end and front-end processes of the business. The automation of marketing, communication and purchasing processes simplifies the activity and effort of customers, improving information access's easiness and speed, payment easiness and security and finally the usability and assistance in the use of products and services, creating the perception of convenience in the buyer.
- Individualization: it refers to the tailorization of the different steps of the value-chain on the specific requirements and characteristics of the customer.
- Ambient embeddedness: It describes how procedures, goods, and communications are embedded into customers' daily activities and environments, such that they are constantly present and an essential part of daily life.
- Interaction: eCommerce enables different ways to interact with customers, and innovative technologies transforming and enriching the nature of these interactions in a more immersive, engaging and informative way.
- Transparency & control: through the development of platforms, social networks and new technologies, customers are empowered, they can have more control over their decisions and influence others. Many innovations are focused on improving the transparency of products and processes of businesses, but also on customer rights and possibilities.

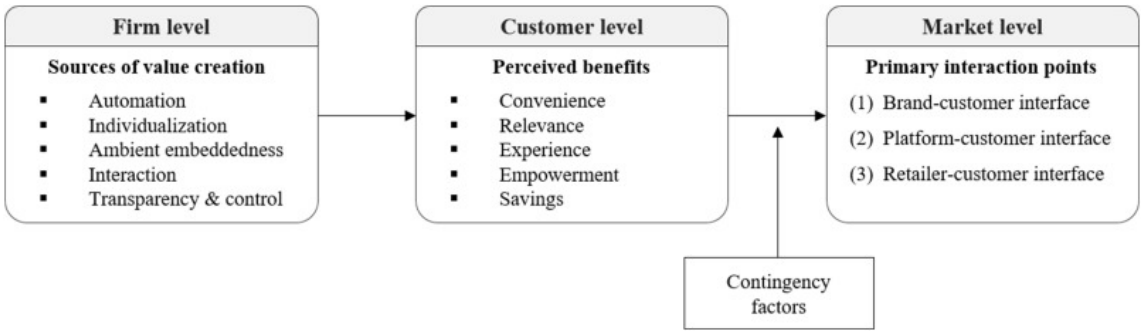

Figure 1.19: Innovation impact on the customer value (Reinartz et al.)

Also, Silva et Al. [42] concentrated their research on the impact of new technologies on the online customer experience and online service quality, focusing on footwear companies. They proposed a conceptual model to analyse the impact of new technologies on the online customer experience and service quality, identifying eight main dimensions:

- Website navigation
- Merchandise
- Reliability
- Customer service
- Privacy and security
- Customization
- Connectedness
- E-interactivity

As we can see there is an overlap in the different dimensions with the ones identified by Reinartz.

Finally, technological and business model innovations not only have major impact on the final customer, but also in the relationships between retailers, eCommerce platforms, manufacturers and various service providers.

The digitization of most of the processes, in combination with the supply chain optimization and the possibility to collect and analyse primary and secondary data, is enabling more efficient resource management and better demand forecasting. This effect extends to all actors involved, as real-time data and information sharing is becoming the norm, enabling closer collaboration and more effective product distribution.

At the same time, even small manufacturers are changing their distribution models thanks to easy access to advanced fully integrated eCommerce system with very low costs, thanks to the rapid diffusion of SaaS providers.

As reported by [43, 44], the dynamics between service providers and eCommerce businesses are continuously changing presenting new challenges and growth opportunities.

Finally, to summarize the different antecedents, forces and factors affecting technological innovation in the eCommerce sector, it is provided the technology adoption model developed by Shankar et al. [45].

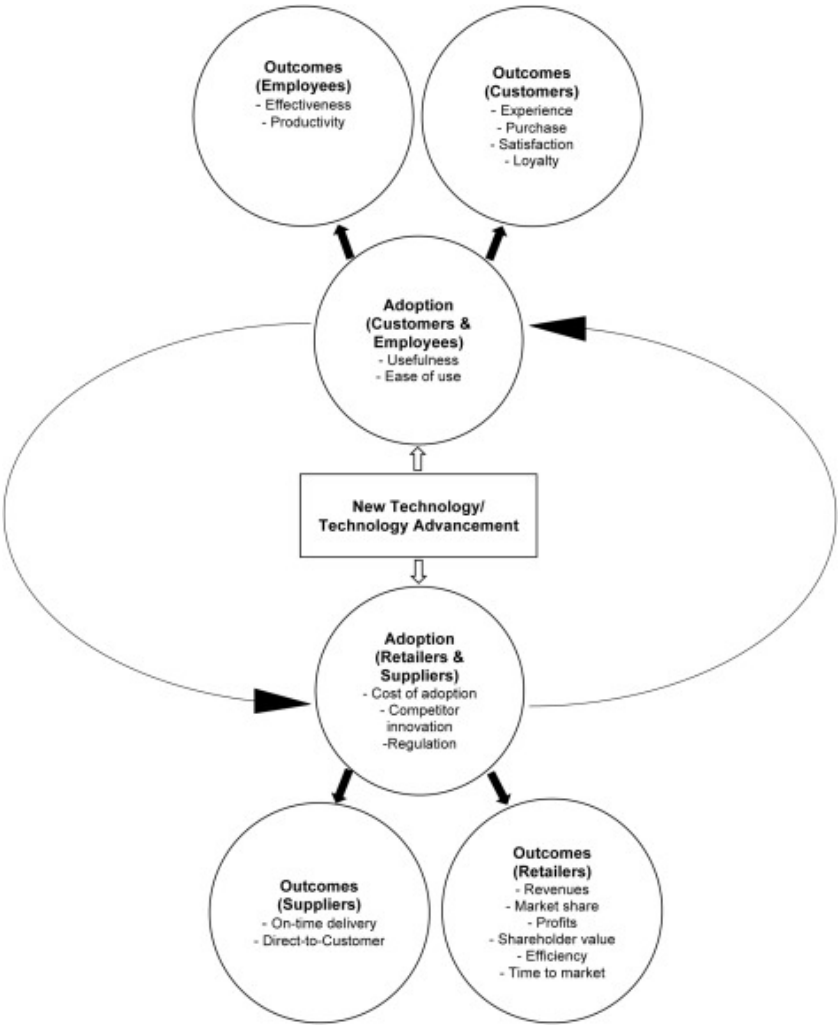

Figure 1.20: New technology adoption model (Shankar et al.)

1.4.2. Emerging technologies clusters

After having explored the dynamics of innovation in the B2c eCommerce context, it is important to deep dive on the main emerging technological clusters that are affecting all the industries. They are the foundational elements of different industry-specific solutions.

Below are presented the six clusters of emerging technologies:

1.4.2.1. Artificial intelligence

When talking about artificial intelligence there is not a single generally accepted definition of it, but many researchers provided different definitions based on the specific topic covered, that can also be related with philosophical and ethical considerations.

The first reported definition of artificial intelligence was the one of Stanford Professor John McCarthy in 1955, who stated that AI is "*the science and engineering of making intelligent machines*" [46]. Sheikh et al. [47] assert that "*In its strictest definition, AI stands for the imitation by computers of the intelligence inherent in humans.*", these two definitions are strictly related to the concept of intelligence, but the boundaries to distinguish if a computer machine is capable of intelligence are very blurred and difficult to evaluate. A more practical and technology-related definition is the one of the technological and consulting firm Gartner, that "*defines artificial intelligence (AI) as applying advanced analysis and logic-based techniques, including machine learning (ML), to interpret events, support and automate decisions, and take actions*" [48].

With the introduction of artificial intelligence, machines can understand the technical system in which they are introduced, identify problems of different natures, and fix them while working toward an objective, which can be predetermined or unknown, as in the case of generative AI. Data acquired by the system, through the use of different sensors, are prepared and analysed through the use of machine learning techniques and following actions are determined based on parameters, best practices or modify their approach because of learnings from past experiences of the system, trying to emulate human behaviour.

In the last 15 years AI technology has seen an increasingly interest and many new applications have been developed. First applications of artificial intelligence in retail, were in expert and knowledge systems, enabling customers to get recommendations and improved research. In present days, with many technological advancements in the power, capability and quality of artificial intelligence systems, it is increasingly similar to human behaviour, and so, more capable of predicting events, solving problems, understand complex situations and dynamically interact and collaborate with other agents, which can be both humans and machines.

In their study [3] , Fedorko et al. have analysed the main applications of artificial intelligence in the eCommerce environment. The impact of AI can be observed in all the different stages of the eCommerce value-chain, from the creation and optimization of pre-sale marketing activities to the after-sale management of different services or the addition of AI features to products. In the paper, four main application categories were highlighted: AI chatbots, recommendations tool, visual & voice search and, lastly, customer relationship management. The main benefits of these applications are summarized in Figure 1.21.

Figure 1.21: Benefits of artificial intelligence (Fedorko et al.)

The increasing interest in artificial intelligence is not only from an academic and research perspective, but also from the business one. In fact, looking at the latest CEO Outlook Pulse [49], released by the consulting company EY, 68% of interviewed global CEOs in 2023 "*see AI as a force for driving business efficiency*" and 88% "*are integrating AI into capital allocation, almost half plan significant AI investments in the next year*". For this reason, it is very important for businesses and managers to deeply understand the technological foundation, discover the different applications and use-cases in their sectors and finally evaluate in which invest resources and implementation efforts.

One of the latest developments of artificial intelligence is generative AI, which owes its popularity to the conversational chatbot ChatGPT, of the technological company OpenAI, that had an incredible diffusion speed, reaching the first 1 million users in 5 days, and the first 100 million in only two months after the launch. It created a wave of new interest and investments in the sector, with new start-ups being funded and financed every day [50].

As the name suggest, the differentiating factor of generative AI compared to other forms of artificial intelligence is the capability to generate or predict, totally new content (written, visual, audio and data), starting from a series of inputs that can be more or less structured, giving results incredibly similar to the ones of humans.

1.4.2.2. Internet of things

The concept of Internet of thing started to arise with increasing frequency in the last ten years.

In their research, Lynn et al. [51], define a technical and a socio-technical perspectives to describe the internet of things. In the first case they reported IoT as "*about innovative functionality and better productivity by seamlessly connecting devices*" and also "*a paradigm where everyday objects can be equipped with identifying, sensing, networking and processing capabilities that will allow them to communicate with one another and with other devices and services over the Internet to achieve some objective*". These definitions characterize the internet of things as the ecosystem in which every element is connected to the system and activities, events and processes are transformed in electronic information and data that feed the system.

In the book they propose a general framework to conceptualize IoT and understand the different elements involved in it, as represented in Figure 1.22

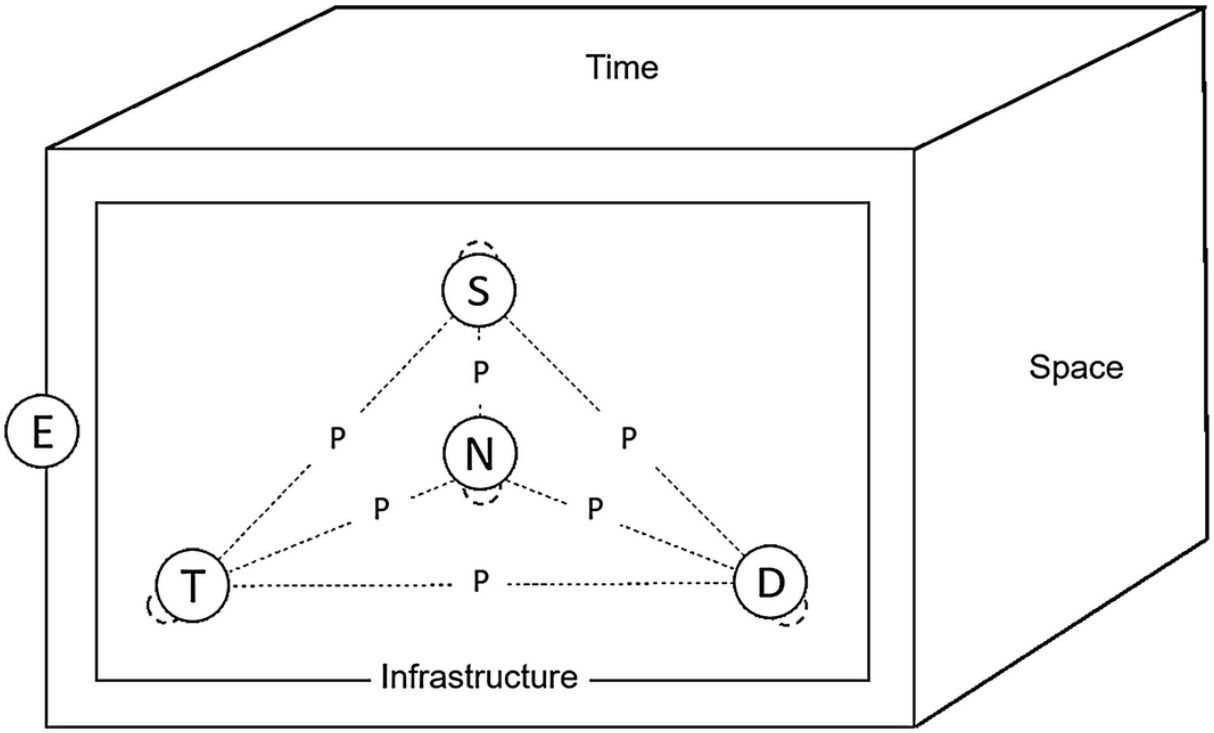

Figure 1.22: IoT general conceptual framework (Lynn et al.)

In the IoT ecosystem are present five core entities, the social actors of the system (S) that can be both human and machines; things (T), that are all the elements related to data collection and system connectivity, they can be both physical and virtual; data (D) that can be associated to both social actors and things, through the occurrence of an event; network (N) is the system connection between all the elements inside the ecosystem, can be physical, wireless or virtual; processes (P) that describes the different relationships and rules between each of the other elements.

IoT relies on a multitude of other technologies like RFID, GPS, sensors, WIFI, NFC and even all the other technology clusters of the section.

As reported by many researches [52, 53, 45], IoT technologies are defining big impacts on the retail and eCommerce environment. The marketing capabilities of online

merchants are being enhanced by continuously linking the business and its spaces with the customer, creating new opportunities in terms of data capture and information management to increase customer engagement and satisfaction. Also, IoT can improve the automation of different processes, from the sourcing of products from suppliers and manufactures, to the management of both online and in-store orders, with applications in the inventory, warehouse and fulfilment operations, and finally, in the connection with delivery partners and after-sales services and quality monitoring.

1.4.2.3. Cloud computing

The term cloud computing is being widely used for different internet services from at least 15 years. Following the definition provided by the IEEE Computer Society [54], cloud computing is "*A paradigm in which information is constantly stored in servers on the Internet and cached temporarily on clients that include desktops, entertainment centers, computers, notebooks, handhelds*".

Are commonly identified three main type of cloud computing services:

- IaaS: it stands for infrastructure as a service, it provides organizations with on-demand infrastructure resources via the cloud (wireless servers), such as computing, storage, networking and virtualization. Customers are responsible for the operating system, middleware, virtual machines and of the application and data layers, the data centre infrastructure is totally on behalf of the cloud service provider, with no need of manage, maintain or upgrade some sort of datacentre.
- PaaS: it stands for platform as a service, in this model the service provider is responsible for an additional layer of the service, the customer doesn't have to build and manage both the infrastructure and platform layers, being provided with all the tools to develop the application layer directly from the cloud service.
- SaaS: it stands for software as a service, this last category is the simplest to manage for the customer, it has only to access the software from a web or application interface (with part of the data saved on the local system) and it can operate completely in cloud, even data can be totally stored in the cloud.

Cloud computing has been a disruptive innovation for many industries, in the context of B2c eCommerce it created many opportunities, in particular for small and medium retailers. In fact, first eCommerce businesses could save money from store rent and physical infrastructure investment, but had to invest in all the digital infrastructure, not only from a connectivity point of view, but also for software development and maintenance, specific IT competences and similar. With the diffusion of cloud computing businesses can concentrate effort and investments in differentiating activities like marketing, pre-purchase engagement and after-sale services, instead of IT complex projects that are not visible from the customer

perspective. The cloud computing also offers complete freedom in terms of resource use and scalability of services, enabling small retailers to quickly increase their operations, defining an elastic company [55]. Finally, cloud computing enables small enterprises to get access to many different architectures and services, without warring about the adoption of a standard and the related integration cost, outsourcing all the IT elements to already integrated tools.

In Figure 1.23 is presented the framework of new eCommerce system with the introduction of cloud computing developed by Wang [56]; the eCommerce enterprise is disconnected from all the different relationships and contractual constraints of the hardware, software, internet and system integrator providers, having to manage only simple subscription or tailored plan with cloud computing service providers.

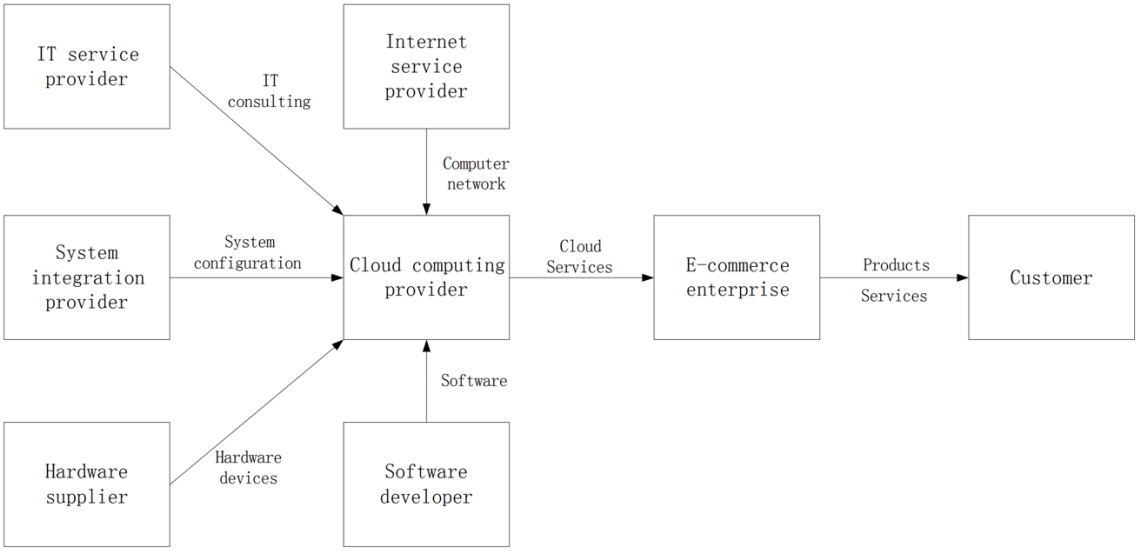

Figure 1.23: Cloud computing role in the eCommerce system (Danping Wang)

1.4.2.4. Next generation connections

Mobile connectivity has constantly evolved from its introduction in the 1980s with the first generation (1G), which enabled the diffusion of wireless public voice service and the firsts mobile phones.

From 2019 different mobile companies, internet providers and other technology firms started to develop and talk about the fifth-generation technology for wireless communication (5G). The technology is increasing all the performance levels of the previous generation, focusing on data capacity, speed, frequency and latency [57], with the goal of enable the user to access the network using simultaneously different wireless technologies.

As reported by the International Telecommunications Union [58]:

- Mobile data volume per area will increase of a 1000 factor.

- The number of devices connected to the network will be one hundred times greater.
- The power consumption for machine communication will be ten times lower.
- End-to-end latency will be five times lower.

Next generations of wireless technologies will require the hybridization of 5G connectivity and satellite communication networks (6G), until the complete development of space roaming for a seamless connectivity (7G) without any data volume, speed and geographical restrictions.

In the eCommerce and retail sectors, next generation connectivity will have many benefits on the whole value-chain. First, it will enable the diffusion of the previously analysed internet of things, providing a high-speed reliable network for real time communication and data transfer. Furthermore, it will increase the level of interconnection between the different actors of the supply chain, both manufacturer to retailer and retailer to logistic provider, and decrease the costs of collaboration and digitalization. Finally, thanks to it, also the customer experience in accessing eCommerce website and applications will increase, in fact the loading speed and up-time of online resources will drastically increase, and also it will enable the introduction of data-heavy experiences in smartphones and personal computers, like 3D interfaces and hyper-realistic extended reality applications [59].

1.4.2.5. XR

Both business experts and academic researchers have shown increasing interest in the so-called immersive technologies.

From a definition perspective, there are four expressions to define all the different immersive technologies that exist: augmented reality (AR), virtual reality (VR), mixed reality (MR) and everything reality (XR), often called extended reality.

Following the study of Raushnabel et al. [60], AR technology *"typically refers to a combination of digital information with the real world that is presented in real-time"*. The presentation of digital or virtual information in the real world can happen thanks to three enablers:

- The AR device: it can be a smartphone, a wearable or everything with computational or connectivity capabilities.
- The AR system: it is the software system that enable the representation of visual elements and their physics on the display.
- The AR display: it can be every type of object with display capabilities (both 2D and 3D).

These three enablers are interconnected and there are human-computer interfaces to enable user interaction, for example sensors and other types of hardware.

Virtual reality refers to all the applications and systems that are totally virtual, providing an immersive artificial environment and experiences to the user, that can define rules impossible in the real world and interact virtual objects through an artificial interface. The concept of virtual reality is often related to headsets devices [61], developed by many technology companies like Meta, Microsoft, Google and more recently even Apple [62], highlighting the huge potential of the technology, even as a disruptor of smartphones and personal computer.

Mixed reality is the combination VR and AR technologies, in fact in the continuum between the real world and the totally virtual world there can be different layers and mixed reality enable to create applications and interfaces that combine totally virtual elements and experiences to augmented ones.

The extended reality concept, go one step further in the integration of real and virtual world, creating an environment in which the different layer of artificial and real elements cannot be distinguished and there is a seamless integration of the different systems, providing the most immersive experience possible.

These technologies enabled eCommerce businesses to evolve from online commerce to virtual commerce.

In [63], virtual commerce is defined as "*the consumption of products and services promoted by the activities in an immersive virtual environment*" and "*includes virtual consumption, i.e., the purchase of virtual objects created in VWs* (Virtual worlds) *with virtual currency, or a mix of virtual–real content and payments.*"

The positive impact of augmented and virtual reality on the eCommerce value-chain has been proved in many researches [63, 64, 65, 66], key applications are in the pre-purchase stage, with interactive marketing activities, such as AR games and billboards, VR stores in the metaverse, but also in the selection of the product by the customer with the display of products directly in the environment of the user, or with virtual try on, that enable the customer to try a product directly on him, based on his unique characteristics. AR and VR have also impact on the post-purchase stage, for example with augmented packaging or product virtual features.

XR can have also many impacts on the digitalization of processes, creating digital twin of entire manufacturing factories, warehouses and inventories and also of the store, facilitating the work of employees and assisting them with enhanced visualisation of information and data.

1.4.2.6. Blockchain

In the latest years the concept of blockchain had ad an incredible diffusion, this mainly thanks to the financial speculation related to the Bitcoin, the revolutionary peer-to-peer electronic cash system that was created in 2008 by an anonymous group, under the name of Satoshi Nakamoto.

In his publication [67], Satoshi Nakamoto define the bitcoin system as an "*electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party"* and the general concept of blockchain as "*peer-to-peer distributed timestamp server to generate computational proof of the chronological order of transactions*".

The blockchain uses the electronic information network to connect the different nodes (blocks) and secure all the data related to transactions inside the register of each node, in this way information can be managed and modified only with the approval of the other nodes, eliminating the element of trust in a single central control, witching to an open and distributed ledger.

As reported by Treiblmaier et al. [68], the literature concerning cryptocurrencies first, and blockchain after, has accumulated from 2008 on, with a peak of hype and expectations, over its application without any drawbacks, in many different industries in the latest years of 2010s.

In the context of eCommerce, three main impacts are identified with the introduction of blockchain technology in the industry.

The first one is the disruption of the supply chain management, with the definition of an effective operation management system, for both inbound logistics and outbound logistic, national and cross-border. With blockchain, different businesses and entities, that provide services and value in the eCommerce industry, are relived from the problem of trust, that can be caused by the discrepancies in terms of cultures, legal provisions, and consumption habits of different countries, regions and firm policies. [69]

Trust is eliminated through the dis-intermediation nature of the blockchain, that with smart contracts and peer-to-peer open systems guarantee a new level of transparency and visibility for products, data, processes and services, enhancing the collaboration between the different actors.

The second impact is related to payments, in fact the blockchain enables businesses to connect with cryptocurrency systems. This has a double effect, in fact it enables customers that wants to use cryptocurrencies to purchase with them and, also, to guarantee a new level of security in transactions, reducing the probability of fraud or errors in the processing of sales due to system failures.

The last impact is the creation of the decentralized web, also called Web3, with NFTs, digital wallets and collectibles. The word "Web3" describes a new version of the web based on the Blockchain and principles such as decentralization, the composability of applications, the accessibility of services, data privacy and the possibility for users to own and exchange digital assets and manage own online identity without intermediaries.

This new form of the web offers the possibility to create interoperable decentralized applications (DApps), in which different functionalities can be combined and integrated with each other in a modular way. This allows developers to create customized and innovative solutions, expanding the possibilities and opportunities offered by Web3.

Blockchain technology can also impact the world of digital advertising and more generally the media. Three areas of application have been identified for this sector: advertising (and more specifically user engagement and media transparency), Content (copyright management and identification of fake news) and social media (from identity to advertising).

NFTs are being increasingly used in the B2c eCommerce sector to engage with customers, create loyalty programs and one-to-one connections with the community. The tokens become the access point to special releases, physical and virtual events, discounts or other marketing initiatives, but also a distinctive sign for customers and fans to show off to others. This is especially true for fashion & luxury businesses, in which the product itself is only one of the many determinants of a purchase, in which customers wants to feel engaged and be part of a community, standing out from others [70].

2 Scientific literature review

A systematic literature review of scientific paper was the first step to address the topic of innovation in B2c eCommerce, focusing on the main innovative trends in business models, technology, customer experience, business management and key actors of the industry, such as retailers, customers, service provider and start-ups, that previously were introduced in the thesis.

The main reason of the literature review analysis was to explore if and how the academic researchers have identified and developed the different emerging topics involved in eCommerce innovation and to find a gap in the literature. Through the use of the scientific literature review, it was possible to get insights about most relevant and pertinent aspects, as well as how they are analysed from a theoretical perspective and, which technologies are currently used, and which will become the next standard affecting the current eCommerce landscape and the start-ups ecosystem.

The next section focuses on the methodology and procedures used to conduct the literature review.

2.1. Methodology

To conduct the review in the most structured and objective way, an organized procedure to collect, select and analyse the different papers was followed.

The procedure articulated in four main phases:

1. *Scientific papers research*: the first step consisted in explore all the different papers available through online academic search engines. To conduct the papers search, the key resource was the online library of the Politecnico di Milano, in addition, if results of the research were not sufficient, also the online library Scopus and the research engine Google scholar were used.
   The research was conducted through the use of different filters and keywords. Because the thesis explores which are the latest innovative trends in the B2c eCommerce environment, only articles officially published and accepted after 2018 were taken in consideration. This choice helped reduce the number of eligible publications, but at the same time, it can have eliminated some topics that are not very innovative from an academic perspective, but from a business one, they can be as innovative as others.

Regarding the keyword, a variety of words from different themes and topics were use, it was also important to include all the different possible variation of words with the same meaning. An example can be the use of all the words "eCommerce", "ecommerce" and "electronic commerce", but also the word "online commerce" that in many cases was used to refer exactly to the same topic.
The main keywords used were: eCommerce, *B2c, innovation, trend, future, digital, transformation, disruptive, technology, start-up, open innovation, marketing, payment, platform, customer experience, logistic, AI, AR, blockchain, IoT, 5G, cloud computing.*
A combination of these and other keywords was used to have the most comprehensive database.
As the last element, only peer-reviewed articles were accepted in the analysis.

2. *First selection*: using the different filters and keywords highlighted in the previous point, the first list of papers was selected and uploaded in an Excel database with synthetic bibliographic information: Title, publishing journal and abstract.
   To do the selection, all the titles and abstracts were read, and subsequently the most promising ones were kept, with the elimination of non-relevant ones.
3. *Second selection*: from the previous list, the papers were read in their entirety. To choose if a publication was relevant or not the scope and diversity of topics, technologies and processes of the B2c eCommerce value-chain were the main evaluation elements. Articles concerning a single technological application, or a single innovation, were eliminated, because the focus of the analysis is to understand macro-trend of innovation, not the single applications in detail.
   Also, during the reading, each new element introduced by a paper was analysed to simplify the following phase of framework creation and literature analysis.
4. *Papers analysis*: in the last steps all the selected articles were summarized, and important citations and innovation elements were highlighted. The analysis framework was filled with all the elements present in each paper, to enable a quantitative analysis of the academic publications.
   The framework structure, that will be presented in the next section, went through a series of iterative modification, to be the most accurate and comprehensive possible.

2.2. Literature analysis

From the selection described in the previous section, a total of 41 papers were chosen, that provides a general overview on the different innovative trends that are characterising the present and the future of the B2c eCommerce industry.

The complete list of papers included in the literature review is reported in the the Appendix A section.

2.2.1. Literature analysis framework

As said before, to evaluate in the most accurate way the present scientific literature and provide quantitative insights about it, an analytical framework was developed, with all the descriptive information of the articles and with the main topics and themes related to B2c eCommerce innovation.

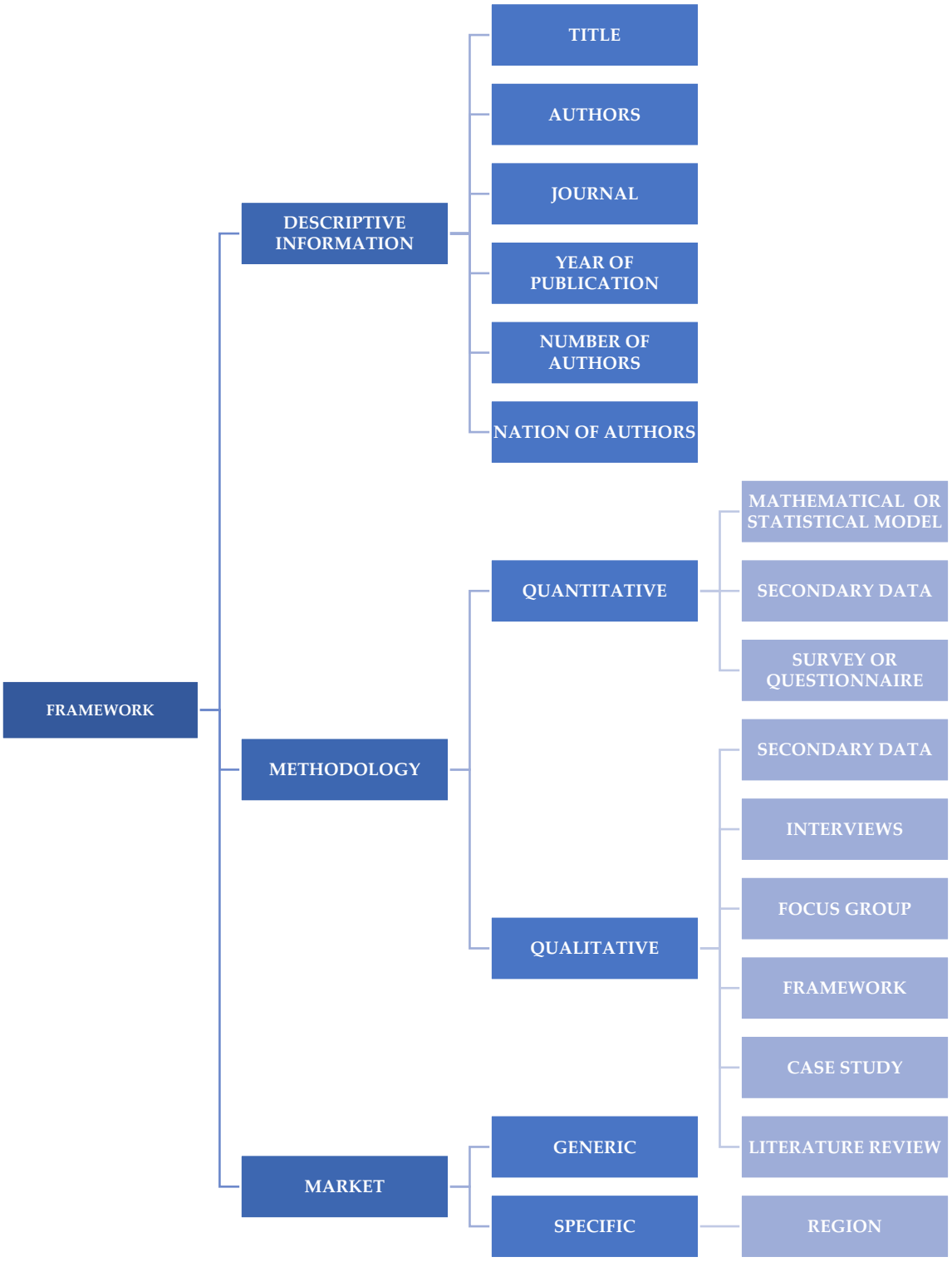

Figure 2.1: Literature review framework (1)

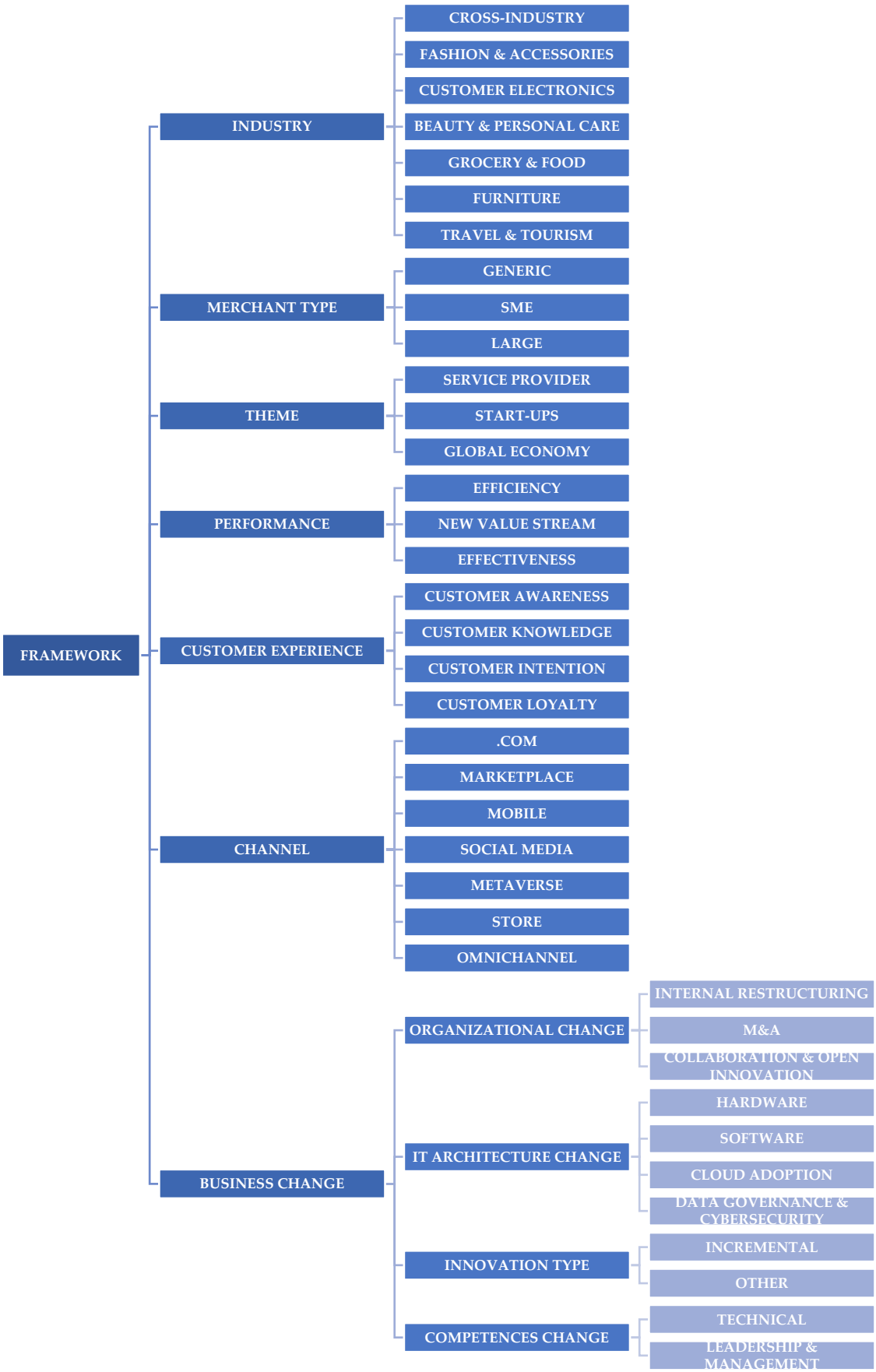

Figure 2.2: Literature review framework (2)

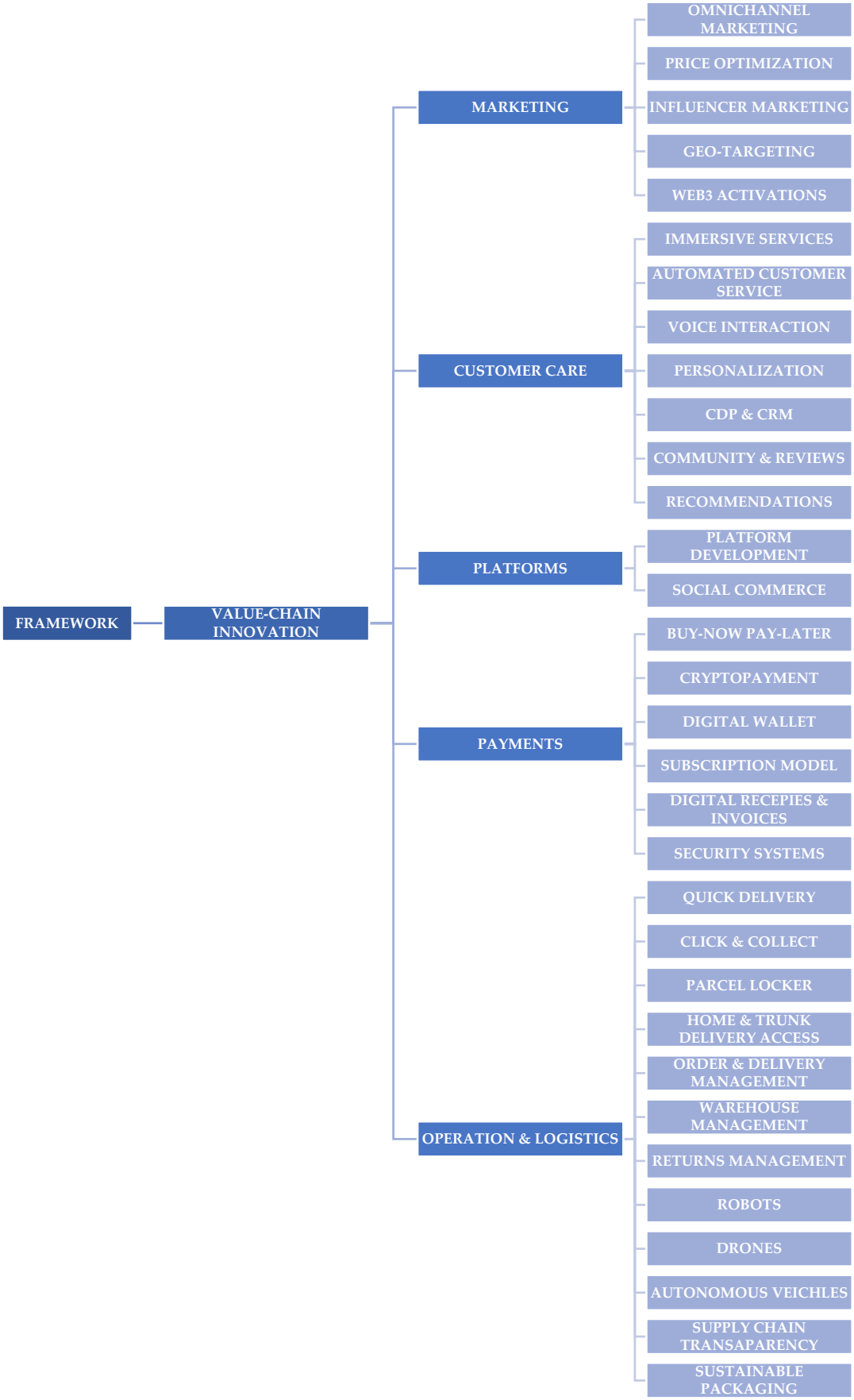

Figure 2.3: Literature review framework (3)

As can be seen in Figure 2.1, Figure 2.2 and Figure 2.3, the analysis framework is composed by eleven main categories. The first two sections are related to paper general information and methodology used by the authors, the next eight categories analyse the different general topics covered in the papers. The last category is related to the different service and technology innovations that researchers recognize as the ones that will affect the current state of B2c eCommerce value-chain, it is the category with the greatest number of sub-topics, and consequently it is the one that required the most classification effort.

In the next two sections all the different categories of the framework will be presented with their key insights.

If not specified in the chart's caption, all the statistics presented in % are referred to a sample base of 41 papers.

2.2.2. Descriptive analysis

In this section will be analysed key metrics concerning the general information of the selected literature.

2.2.2.1. Publication year

Firstly, looking at the publication dates of the articles, it is possible to analyse their time distribution, as can be seen in **Error! Reference source not found.**.**Error! Reference source not found.**

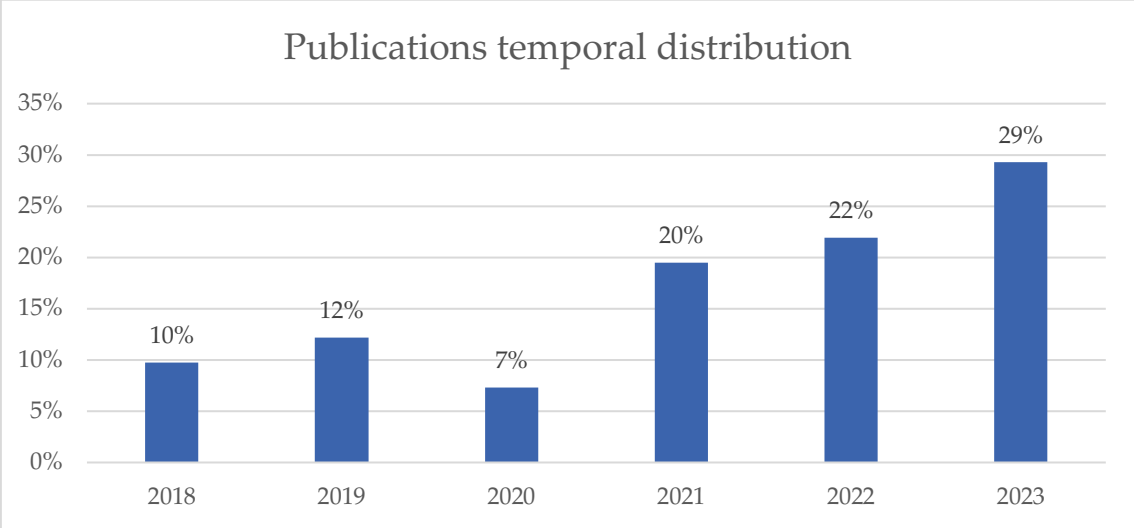

Chart 2.1: Scientific paper distribution by publishing year

It can be noticed that the literature has an increasing concentration in the years, with 2023 being the year with the greatest number of articles (12). This result can be explained with two main reasons: first, the newness of the topics, in fact the review wants to analyse and understand which are, not only the current trends affecting the B2c eCommerce, but also the future directions of the industry; second, the bias related

to already seen applications and technologies could have brought to eliminate articles that are not seen as in line with the current state of innovation.

2.2.2.2. Publication journal

For what regards the publication journal in which each paper was published, summary results can be seen in the Appendix A. There are five sources with more than one paper selected, three of them are thematic journal specific for the context of retail or even eCommerce, the other two are generic ones, as highlighted in **Error! Reference source not found.**.

Publication journal	Number of papers
International Journal of Retail & Distribution Management	3
Journal of business research	3
Journal of Theoretical and Applied Electronic Commerce Research	3
Sustainability	3
Journal of retailing	2

Table 2.1: List of journals with more than one article published

Analysing the authors two elements can be distinguished: the number of authors that concurred in the publishing of an article and the country of affiliation of the authors.

2.2.2.3. Authors number and geography

Looking at the number of authors, can be seen that to the writing of the 41 papers have concurred a total of 137 different authors, with an average of 3.34 authors per paper and a median value of 4 authors. The distribution of number of authors can be seen in Chart 2.2.

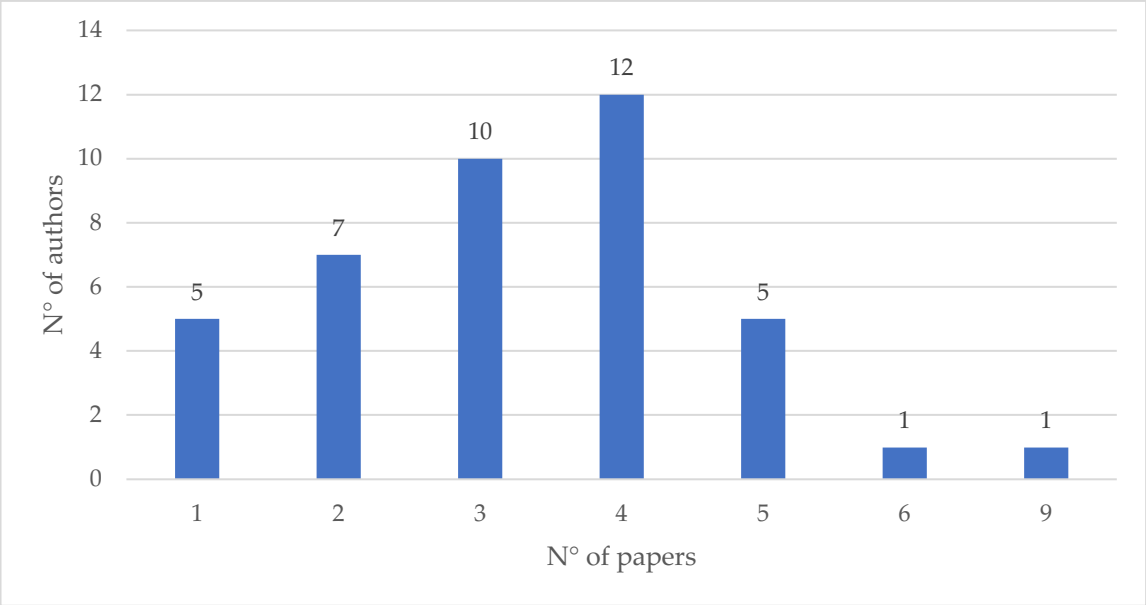

Chart 2.2: Distribution of papers by number of authors

The great number of different authors involved in the writing of the papers increase the confidence and reliability of results, to have an optimal variety of perspectives and a wide overview on the different topics.

Also, the reference geographical area of the different authors can have an impact on the results of the review, in fact often studies and theories are influenced by both the academic and cultural background of researchers. Furthermore, the geographical analysis of authors can helps identify which are the major contributor to the topic of B2c eCommerce innovation in the world.

In total, are identified 30 different countries to which authors are affiliated, as reported in the Appendix A. The most represented country is USA, with a total of 9 papers published, it is followed by India and UK, with 6 and 4 papers respectively. Germany and Canada record both 3 publications and after them there is a big group with 2 papers for each country (Australia, China, Finland, Indonesia, Italy, Portugal, Russia, South Korea, Spain, Sweden and United Arab Emirates). The other 14 nations have only one publication each.

2.2.3. Quantitative analysis

2.2.3.1. Methodology

The second category of the framework *Methodology* refers to the methodology applied in conducting the scientific research. This category is divided in two sub-sections: *Quantitative* and *Qualitative.*

Authors can apply in their paper one or both the methodologies in combination.

As showed in the Chart 2.3, the majority of papers (57%) applied qualitative only methodologies, against 47% that applied both quantitative and qualitative methodologies.

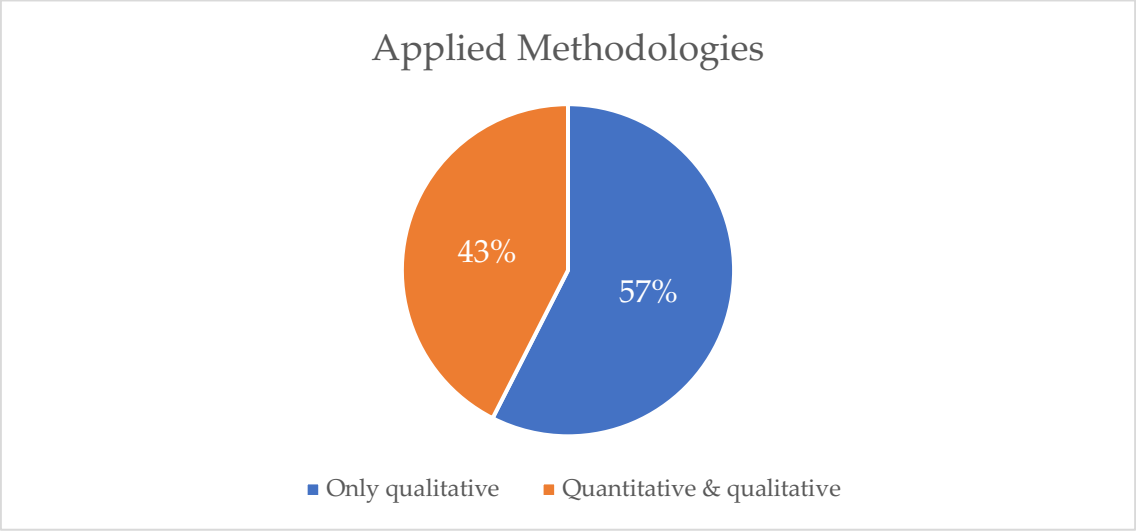

Chart 2.3: Distribution of papers by applied methodology

This result underline how the approach to understand innovation trends and forecast possible future scenarios, is much easier to accomplish through qualitative analysis than quantitative ones. An important factor that impacted on this result, is also the fact that during the selection, papers with brooders scope and general overview were preferred to the ones related to single applications.

Looking into the paper that presented the quantitative approach in combination with the qualitative one, authors have used three different methodologies: mathematical or statistical model, use of secondary data, surveys or questionnaires. These methodologies involve the use of statistical modelling and measurement to give insights about correlations, behaviour and confirm hypothesis through the use of numerical values.

The Chart 2.4 shows the different adoption levels of the three methodologies over the total number of papers that use both quantitative and qualitative methodologies.

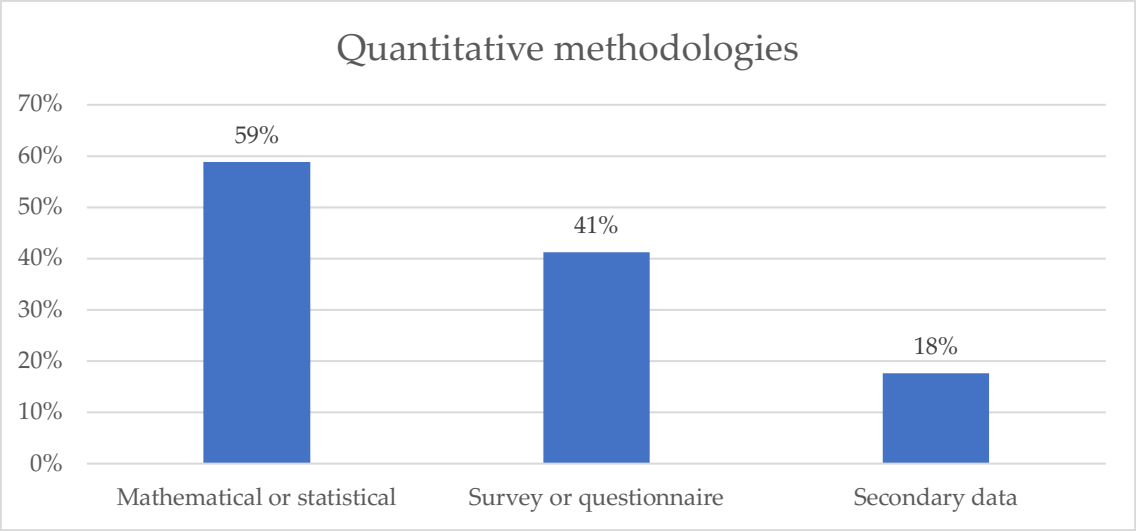

Chart 2.4: Distribution of papers by quantitative type (over 17 papers)

The most used methodology is the mathematical or statistical one, with 10 papers using it, followed by survey or questionnaire methodology, with 7 papers and, finally, only 3 papers using secondary data, highlighting how other methodologies are much more preferred to analyse innovation trends.

The quantitative or statistical method has been often used to evaluate technologies and their impact in financial, quality and operative terms.

The survey or questionnaire methodology have a strong presence, mainly thanks to researches and studies concerning people behaviours and feelings, both customers and managerial professionals.

Looking at qualitative methodologies, have been used six different types: Literature review, secondary data, framework, interview, case study and focus group.

As the word qualitative explains, all these methodologies don't rely on numerical models, but try to extrapolate insights from non-quantifiable data and subjective judgement. These methods are used when the topic of the study has intangible or inaccurate data, that are difficult to source or measure.

The distribution of papers based on qualitative methodology type can be seen in Chart 2.5.

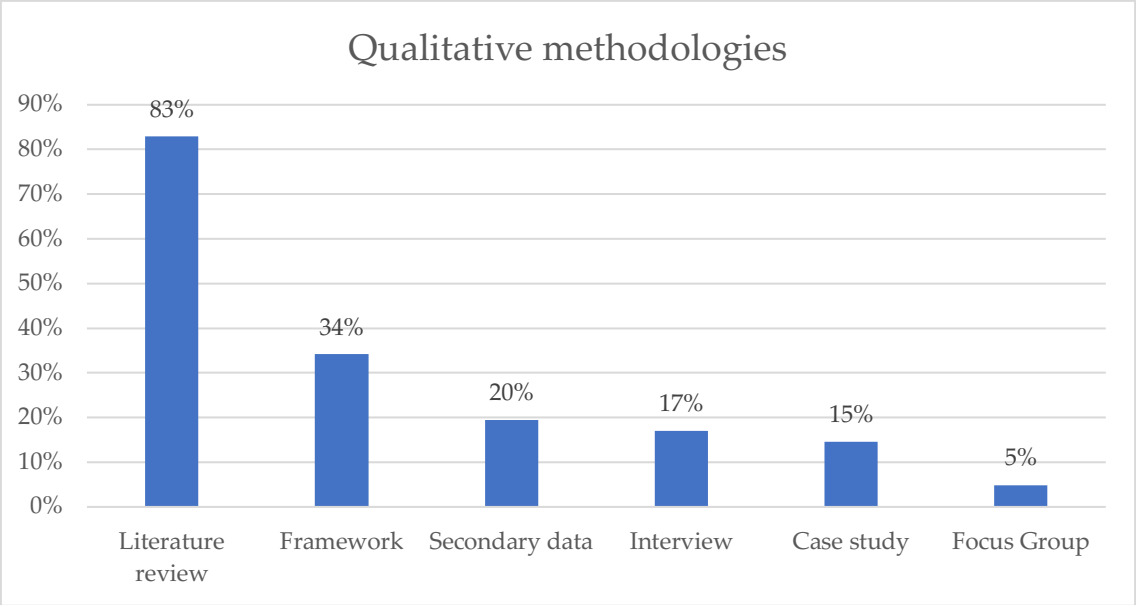

Chart 2.5: Distribution of papers by qualitative type (over 41 papers)

From the data, emerges that Literature review is present in the large majority of papers, in fact it is a methodology that enable to increase the reliability of the study, and enables researchers to have a better understanding of the proposed topic, with an easier and more comprehensive introduction of the case to the reader.

Also, the use of framework to present and discuss a thesis in a paper is widely used, the methodology enables to structure in a more scientific way all the qualitative, and so more subjective, consideration that are proposed. The framework modality is also useful for the reproduction of a qualitative study in different conditions from the one of the original, so it can enable other researchers to adapt the study to their variables, maintaining the structural validity of the study.

2.2.3.2. Market

In the category *Market*, it is reported if the authors referred the study to a specific location or taken data from a specific geographical market, as for example in the case of [71], in which Kim et al. interviewed customers from South Korea. Instead, all the works that are not explicitly referred to a specific market are tagged as generic.

The distribution of papers referred to generic and specific markets, can be seen in Chart 2.6.

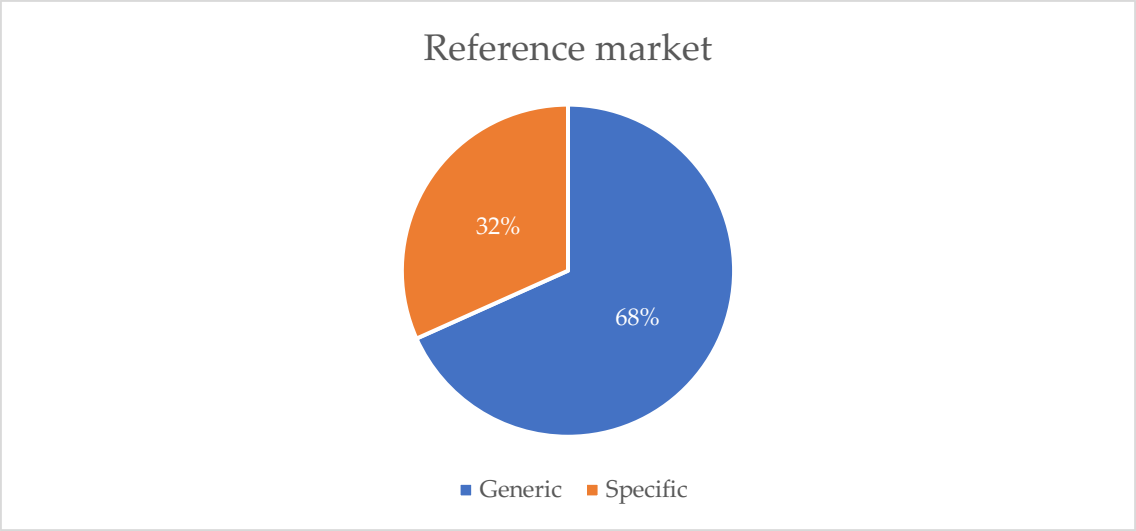

Chart 2.6: Distribution of papers based on the reference market

Most papers make considerations and give insights that are generally applicable, not related to a specific market, cultural background or specific industrial region.

The remaining 13 papers are referred to specific countries, in particular: UAE, Germany, Portugal, South Korea, Malaysia, Russia, Sweden, China, Indonesia, USA, India, UK. All of these countries are represented one time, with the exception of Indonesia, that has 2 papers referred to its market, of which one [72] is specific for the B2c eCommerce innovation in the capital, Jakarta, focusing on the role of the ex start-up service provider, Acommerce, in the eCommerce development and innovation in the Indonesian context.

2.2.3.3. Industry

The following dimension of the framework is related to the industries or sectors that are taken in consideration in each paper. The research can have a cross-industry focus, with the aim to analyse and present innovative themes concerning B2c eCommerce that are transversal to the different sectors, or industry-specific, focusing on one or more industry and presenting use cases and trends specific for that situation, and so maybe non applicable to all the industries.

An example of cross-industry paper can be "*ECommerce trends*" [73], by the Romanian researcher Maria-Cristina Enache, in which, through the use of citations of existing literature and qualitative secondary data from other publications, are presented many innovation trends that are characterizing the eCommerce environment.

In the Chart 2.7 is presented the percentage of papers that discuss industry-specific and cross-industry themes.

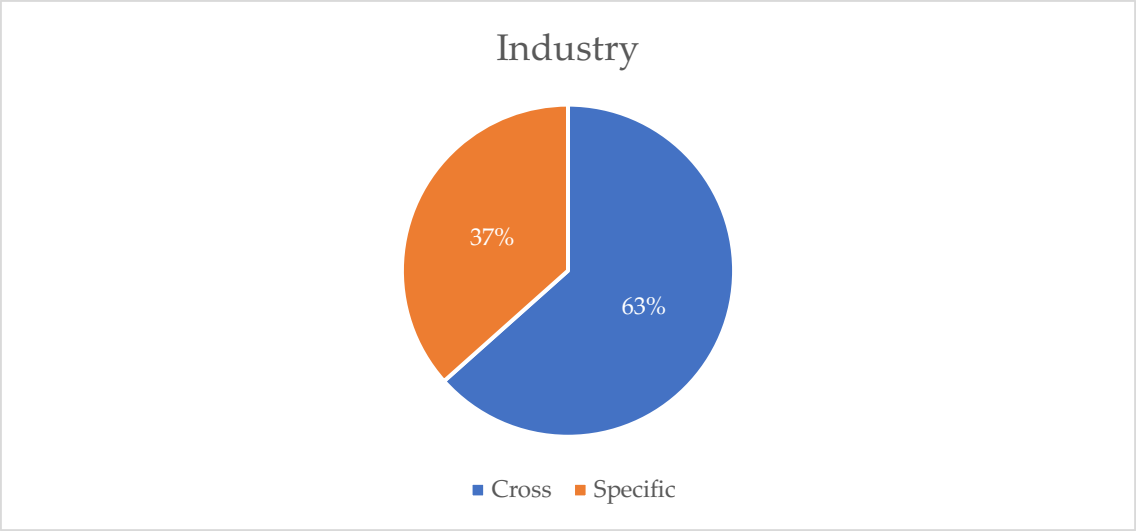

Chart 2.7: Distribution of papers based on reference industry

Most of the publications take deal with cross-industry elements of B2c eCommerce, not concentrating on use cases specific for a single industry or providing a complete overview on all the industries and the related innovation trends that are shaping them.

To analyse the specific industries covered by researchers, it is used the same sectorial division of B2c eCommerce described in the section 1.3.1.5, with the exception of Online meal delivery that is merged with the Food & beverage sector to form the new Grocery & Food category. This integration was made because in the scientific literature, when researchers explored topics concerning the online grocery sector and food and beverage, also the topic concerning restaurants and online delivery services of the -ecommerce were always assessed.

Looking at the distribution of articles by specific industry, as showed in Chart 2.8, it is clear how *Fashion & accessories* and *Grocery & food* categories are the one with the most attention from scientific research.

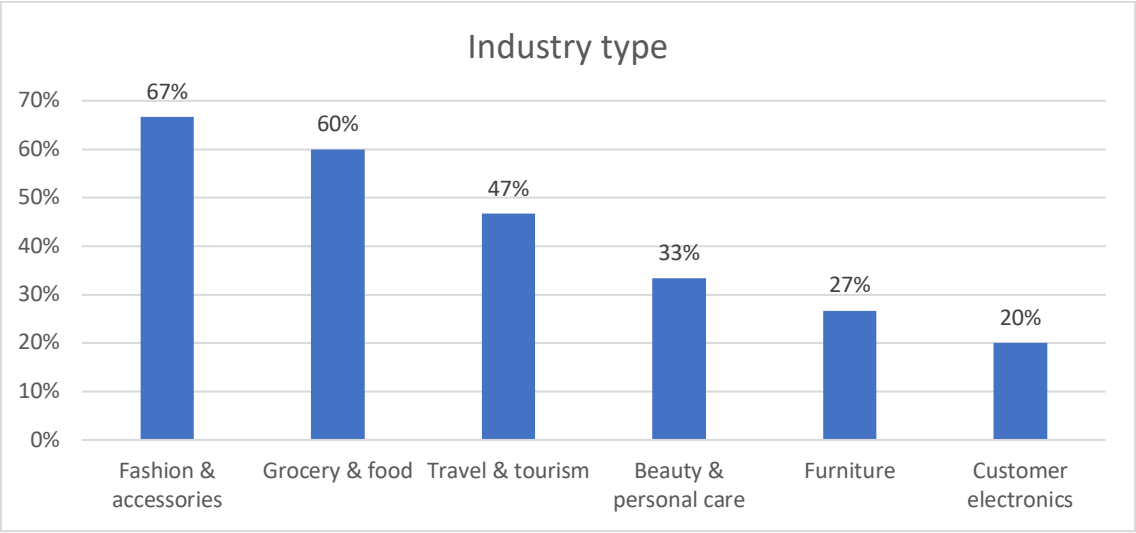

Chart 2.8: Distribution of papers based on specific industry (over 15 papers)

The major interest is often related to the unique characteristics of the two industries. In fact, the *Fashion & accessories* sector, is often described as the one in which customer experience is the major determinant factor, and in which the experience requires different activities and processes respect to other ones. An example that highlights what has been said can be the article "*How footwear companies can use online CX to WOW customers*" [42], in which Silva et al. developed a quantitative study about online customer experience in the fashion market, specifically Portuguese footwear retailers. In the paper, they proposed both an online customer experience path and a framework to evaluate the impact of digital technologies on eCommerce customer experience of different footwear brands (comparing the low-price segment with the high-price segment).

The increasing attention in the *grocery and food* sector by researchers, instead, can be related to the incredible growth of the food B2c eCommerce market, as seen in the section of the previous chapter, and the fast developments of food delivery platforms like Just Eat and Uber Eats that are disrupting the traditional restaurants experience.

2.2.3.4. Merchant type

To have a complete analysis of the literature and understand if findings and theoretical models are strictly related to specific type of situation, environments and businesses, a classification of the paper regarding the type of merchant considered in the studies is provided.

The papers can have a general focus, without distinguish between merchant type, or can put a specific attention on the innovation trends concerning two different type of eCommerce players: small and medium enterprises (SME) or large corporates.

The Chart 2.9 highlights the key findings related to merchant type addressed by the selected literature.

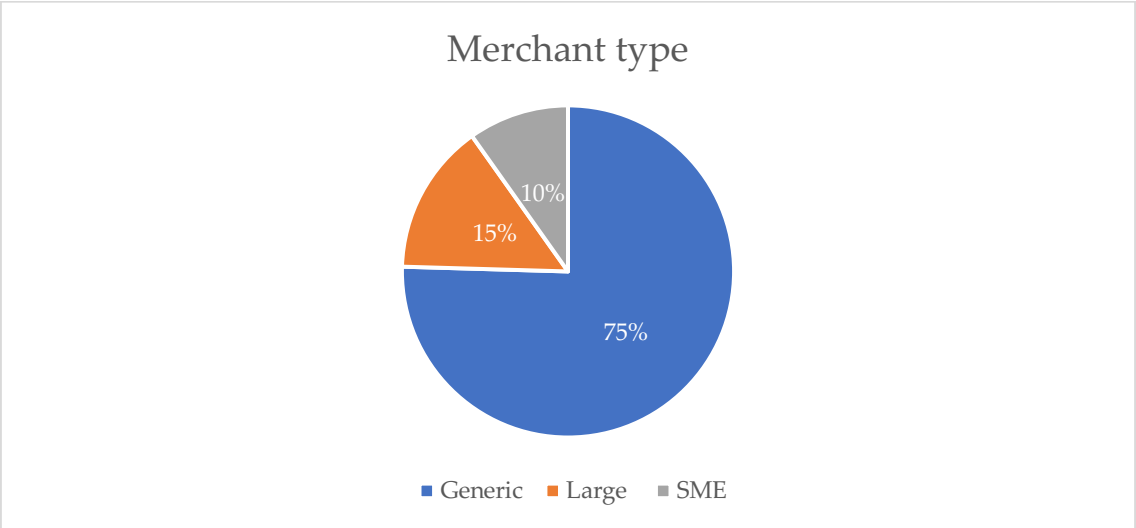

Chart 2.9: Distribution of papers based on merchant type

The majority of papers (31) does not explicitly refer to SME or large companies, providing generally valid insights and trends, applicable to both the types of eCommerce.

For what concerns specific papers, more (6) take in consideration data and business situations related to big organizations. The paper "*Retail service innovations and their impact on retailer shareholder value: evidence from an event study*" [74], developed by Lamey et al., the research explores the different innovations in the retail context, with a specific focus on B2c eCommerce, and the related impact on the business, through and event base study that analysed 350 innovation announcements of publicly traded companies. The results of this paper can provide general directions to both academic and business experts, but the findings could differ if related to SME.

The remaining 4 papers are elaborated taking in consideration SME and the different dynamics that characterize these companies compared to large ones. A good example of this type of paper can be "*Critical Factors in Indonesia's ECommerce Collaboration*", by Nurcahyo et al., that explore the relation between eCommerce actors and technological start-ups in Indonesia, with a focus on payment systems, highlighting how the Indonesian eCommerce ecosystem, that is characterized by the presence of many SME businesses can benefit from start-ups collaboration.

2.2.3.5. Additional Theme

In the sixth section of the framework the papers are classified based on the different general themes that impact the B2c eCommerce innovation environment. There are four main sub- sections:

- *Service provider*
- *Start-ups*
- *Global economy*

Each paper can assess or not additional themes, providing a unique overview over the general topic of eCommerce innovation.

The summary quantitative results of the classification are reported in Chart 2.10.

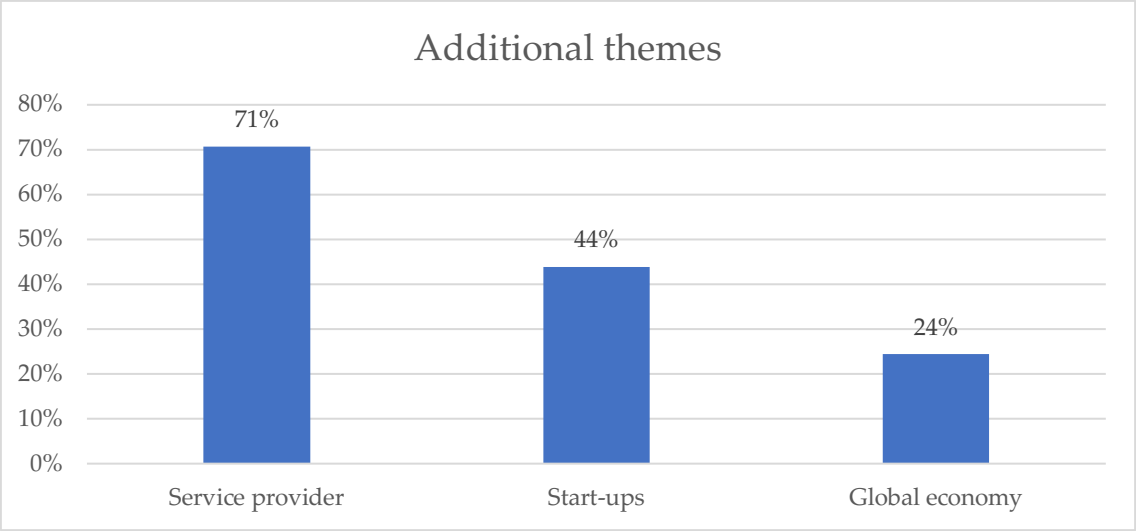

Chart 2.10: Distribution of papers based on addressed additional themes

71% of the papers in the literature review addressed, as a primary or secondary theme of the research, the figure of service provider. As described in the chapter 1, a fundamental role in the B2c eCommerce value-chain is played by service providers, business entities that provide different types of services (internet connection, applications, payment systems, logistic and operation, legal, financial…) and let the business, in this case the B2c eCommerce merchant, focus on core activities, outsourcing all the supporting ones or entire processes and services to the final client, earning a mark-up on them or an increase in the service level, customer satisfaction and so indirectly on the total revenues.

The diffusion and success of service providers, instead of fully vertically integrated companies, is related to the concept of managed services business model, in which a company outsource entire parts of its business to other companies, extracting value from it, in terms of efficiency or effectiveness of the service. The first developments of this model started in the 1980s with the emergence of system integrators and, after, in the 1990s with outsourcing IT vendors [75]. With the development of cloud computing, that is described in the section 1.4.2.3, a new wave of service providers emerged, in particular providing online services under the format of API (application programming interface) that can be called by businesses in every moment, often paying only when needed (pay-per-use subscriptions). This had a beneficial impact on many physical retailers that entered the online business with zero infrastructure or technical knowledge and enabled the rising of digital-native brands and retailers. One of the most famous service providers in the eCommerce world is Shopify, that offers a variety of solutions for online merchants and even end-to-end solution to start and effectively run an eCommerce.

The second additional theme that is recurring in 44% of the articles is related to start-ups. There are many different definitions of start-ups, from a legal perspective, for example, the Italian government describe innovative start-ups as young, high-tech

enterprises with strong growth potential [76]. Two key elements distinguish start-ups from recently born traditional businesses:

1. A high level of investments in research and development (defined as 15% of the total cost or value of the production), that underline how these companies define their value proposition and create their competitive advantage focusing on innovation.
2. Employs highly skilled professionals, like PhD, researchers, master graduates, and technical workers. This element is a strictly related to innovation and R&D activities, that often are entrusted to these workers.

A generally accepted definition of start-up, from the business perspective, is the one of Steve Blank [77], that states "*A startup is an organization formed to search for a repeatable and scalable business model*". To search and reach the repeatable and scalable business model, start-ups use customer and agile development, in this way they can iterate and test their products, services, model and other assumptions in the fastest possible way. The concept of quickness is fundamental for start-ups, in fact these organizations at their beginning stages survive only through third party investments (family and friends, angel investors, venture capitals, private equity, other entities), so they have to be the most flexible as possible and immediately change their configuration in the moment in which when the initial assumptions prove to be incorrect. Start-ups, before being profitable, must demonstrate to investors that the potential market really exist, that the product or service is feasible, with a minimum viable product (MVP) and finally that the business model is scalable, in terms of processes, resources and revenues.

In the digital transformation context, start-ups are new players that emerge as technology and business model innovators, disrupting existing industries and incumbents, but also as bearers of innovative ideas, solutions and services for established businesses and public administrations.

Regarding the first type, eCommerce start-ups, Abhishek et al. [78] states that eCommerce start-ups are "human driven organizations that create/sell innovative products and services on an online platform and aim for sustainable business models under uncertainty", in the study it explores the difficulty of start-ups surviving in the eCommerce environment. It identifies increasing customer base and profits as key factors to succeed and focus on the importance of technology adoption to create and sustain the competitive advantage in the industry, creating a unique value proposition.

The role start-ups as service providers actors in the B2c eCommerce industry is explored by many authors, an example can be the paper "Innovation and ECommerce Models, The Technology Catalysts for Sustainable Developments: The Emirates of Dubai Case Study" by Faccia et al. [15], that explores the eCommerce environment and its innovation trends (technological and business model) in the Emirate of Dubai, also proposing different frameworks to evaluate the impact of innovation on sustainability

attributes (ESG). In the article, the authors take in consideration many aspects of the start-ups' contribution to innovation, describing how collaboration between big eCommerce companies and technological start-ups can increase the competitiveness and attractiveness of the Emirate. They highlight how "*Dubai ranks first globally for foreign direct investment (FDI) and technology transfer in artificial intelligence and robotics*", that are fundamental technologies in the modern eCommerce environment.

Lastly, 10 papers give and overview of global economy events impact on the B2c eCommerce value-chain. The totality of them make observations related to the Covid-19 pandemic and its impact on different aspects of the industry: the difficulties in suppling raw material for DTC companies, to the shortage of labour all along the supply chain, problems related to security measures in the work environment and related to products and processes, difficulties in the logistics network, both for long distance and last mile delivery, changes in the customer behaviour related to purchase of products and services. Other two global events are presented in part of the papers: the new regulations concerning gig economy workers, with the related impact on logistic players, B2c eCommerce merchants and platforms, and the combination of inflationary crisis, that is affecting Western economies, and the war in Ukraine. These last events are explored by only one paper [41], because they are very recent and the time between the writing of an issue and its peer reviewed publishing can take a lot of time. The main identified impacts of the economic crisis are related to increased energy price that have negative effects on the whole supply chain and change in customer preferences and purchasing priority, in fact with very high levels of inflation, customers purchase power is lowered and commodities and primary goods are re-prioritized compared to others, price convenience gets back more importance than extraordinary experiences.

2.2.3.6. Performance

The dimension *Performance* explores how researchers analysed the introduction and impact of technological and business innovations in the eCommerce context. Three main categories of performance improvements are identified in the literature:

- *Effectiveness*
- *Efficiency*
- *New Value Stream*

All the papers addressed at least one of the three performance impact of innovations, the distribution of literature interests in each topic can be seen in Chart 2.11.

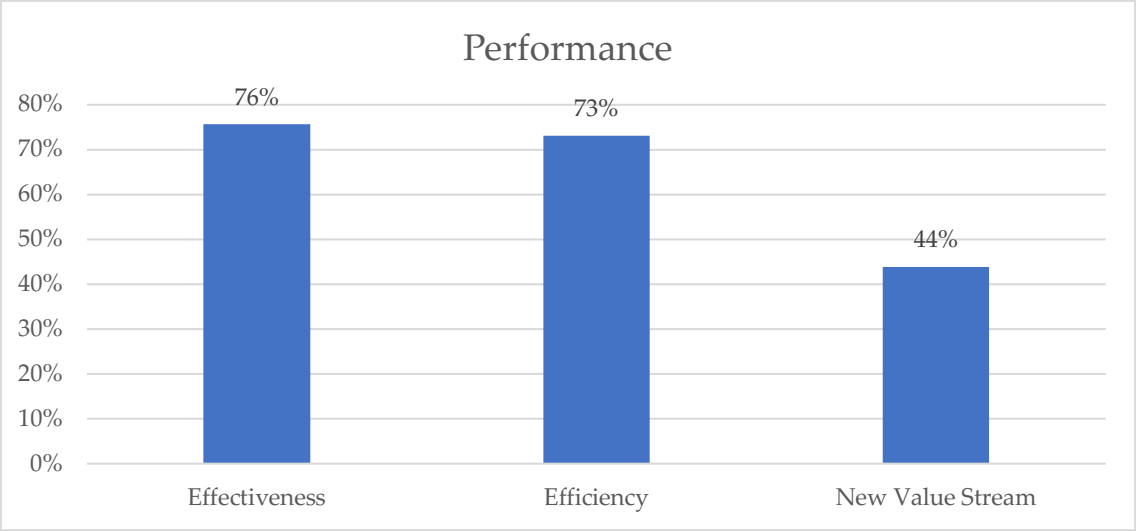

Chart 2.11: Distribution of papers based on addressed performance dimension

The effectiveness is the ability to produce the desired result or output, independently from how this objective is achieved. This category is well addressed by the analysed literature (31 papers), that focus on both the customer-side effectiveness and the supply chain effectiveness. In the B2c eCommerce ecosystem the objective is the sale of the product or service to customers, and many different factors impact the final purchase from the customer. Effectiveness can be related to the marketing strategy implementation and the processes related to it, creating awareness and interest in the customer [42]. Also, it can be related to the payment phase, in which the online transaction must be the as smooth as possible, giving to the customer the highest possible level of flexibility in the choice of preferred payment method, providing to both the merchant and the customer the necessary security, trust and easiness in completing it [79]. Furthermore, the delivery of the product and the use of the of the service by the customer should be aligned with the expectations, ensuring low return rates. Finally, the after-sales services have a great impact and effectiveness on repeated purchases and customer loyalty, so merchants must focus on achieving a satisfactory quality level of these services, through the integration of new technologies or outsourcing them to external service providers [80].

On the opposite side of the spectrum there is the efficiency dimension, that is the ability to produce the desired result with the minimum effort in terms of cost, time, resources, processes and system complexity. The relevance of the topic in the literature is very similar to the one of effectiveness (30 papers). Many researches highlight how efficiency should be sought in every process of a business, and how the digital transformation of the retail industry is rapidly increasing the efficiency level of both SME and large companies. Automated marketing activities and omnichannel management of customers relationships, supply chain integrated processes and views, advanced analytics and forecasting systems, automated warehouses and inventory operations, energy consumption optimization of IT eCommerce systems and

reduction of waste and environmental dangers are some of the main innovative topics that are identified by the literature as addressing the efficiency dimension.

In the paper "*Innovative solutions to increase last-mile delivery efficiency in B2C eCommerce: a literature review*" [81], for example, Mangiaracina et al. developed a literature review of 75 papers, published between 2001 and 2019, addressing the topic of B2c eCommerce delivery process optimization. They analyse all the most important findings of literature, highlighting how the last mile delivery process can be very costly and impact the profitability and economic viability of B2c eCommerce businesses, identifying as key factors of inefficiency failed deliveries, population density in a specific area and automation level of the logistic process. The authors propose a series of technological and process innovations that can increase the overall efficiency.

The last dimension, new value stream, is tackled by 44% of the publications in the literature, highlighting a good interest in the relation between innovation and new value created by it. New value stream represents all the different business models and unique value propositions that can be created by retailers and eCommerce merchants through the adoption of one or more innovations. The new value can be directly related to the final product and service, as for example in the case of selling of NFTs and digital collectibles or the introduction of augmented product features [82]. Also, it can be referred to the general business model designed by eCommerce players, as in the case of "platformization" of online channels, taking advantage of the large quantity of customer data, creating complementary services with them, and the creation of new revenues stream enabling, for example, cross-selling of non-owned products and enabling the selling on proprietary website to third-party merchants [83].

2.2.3.7. Customer experience

Customer experience is defined by [42] as "*a multi-dimensional construct that involves cognitive, emotional, behavioral, sensorial and social components, which results from the set of interactions between a company and its customers during the customer's entire purchase journey*". Customer experience is a key factor in the success of a B2c merchant and many innovations aim to improve it. In this section the different articles are analysed based on the steps of the customer experience funnel that is assessed by researchers, in their considerations. The three steps of the customer experience are:

- *Customer awareness*
- *Customer knowledge*
- *Customer engagement & loyalty*

In the Chart 2.12, it is represented the complete overview of customer experience funnel by literature interests.

10 of the 41 papers of the literature cover the entire customer experience funnel.

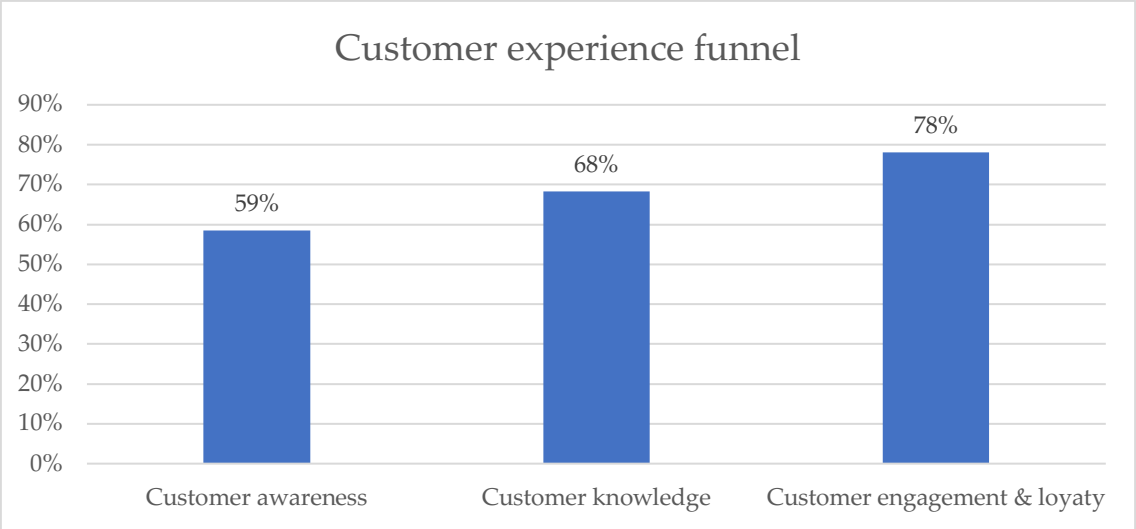

Chart 2.12: Distribution of papers based on customer experience step

Following the customer experience path, the first phase in which customers get in contact and experience an online merchant is the customer awareness. In the analysed literature 59% of the papers define some sort of relation between B2c eCommerce innovations and customer awareness. In this stage, the eCommerce business must increase the degree of consciousness of potential customers. The consciousness can be related to the desire, needs, problems or pain points of the customer. The merchant has to make its existence known and attract the curiosity of the consumer about possible solutions, provided product and services, and how it can solve their problems. To this stage are related all the innovative marketing activities that try to communicate in a new way the value of a product and attract customer attention. Innovations are touching another key point in this phase, the optimization and enrichment of channels through which get in contact with the customer base and the ability to specifically select the right customers to get in contact with.

The second phase is the customer knowledge, that is the most considered by researchers (68%). After having discovered a new product, need or business, customers want to explore the main aspects of the offering, understanding why they should purchase that product instead of the one of a competitor or an alternative one. In this phase it's important that businesses provide detailed information, that are easy to understand and explore, but, at the same time, that are tailored on the customer needs and expectations. Successful e-tailers implements different solutions to educate customers and address any additional concern and doubt, in every moment from everywhere.

In the customer engagement & loyalty, eCommerce players create connections and relationships with their potential customer base and already acquired customers. Customers can be actively engaged with different innovative activities promoted by the brand: are asked how to improve products and services, are enabled to make reviews and get in contact with peer before a purchase, can become theirself the first

promoters of the company and get rewards in exchange, get different benefits for their loyalty and interact with a community of similar people, getting access to special products and events.

2.2.3.8. Channel

B2c eCommerce is strictly related to retail and hospitality industries, the actors of these industries can serve customers in the pre-purchase, purchase and post-purchase phases through a variety of channels. In this section, papers are categorized based on the channel strategy that is described when talking about eCommerce innovation.

Seven main channel types are identified in the literature:

- *.com*
- *Marketplace*
- *Mobile*
- *Social media*
- *Metaverse Platform*
- *Store*
- *Omnichannel*

The statistics related to paper distribution based on the different channels is presented in Chart 2.13.

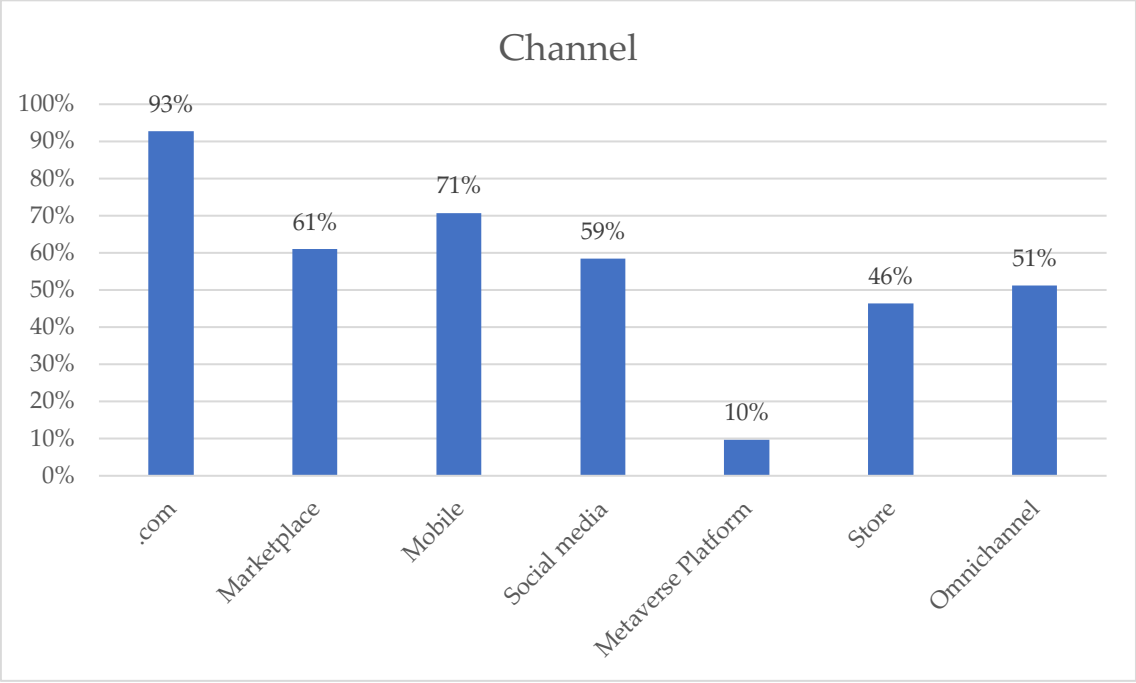

Chart 2.13: distribution of paper based on channel dimension

With .com are classified all the papers that explicitly refer to the use of proprietary website to sale product and services to customers. In almost the totality of papers (93%) are presented innovations that affects the .com channel, highlighting how this channel is the most developed in the online commerce.

Marketplaces, as said in the section 1.2, are platforms or online websites that offers to customers a wide product selection aggregating the offer of multiple suppliers. Also, this channel category is well covered by the literature in terms of innovative solutions, that can be offered to suppliers and final customers by the platform itself, or that are provided by external actors to increase the effectiveness of adopting the marketplace strategy.

The second most relevant channel is Mobile, with 71% of the papers covering it. With mobile commerce, researchers refer to all the advertising, purchases and additional services that happen through smartphones, in both the configurations of mobile-optimized websites and applications. As seen in the section 1.1, the diffusion of mobile connectivity first and smartphones after, had a great impact on electronic commerce, and future forecasts estimate mobile eCommerce to reach a worth 62% of the total eCommerce transactions by 2027 [84]. For these reasons many of the presented innovations are related to m-commerce, how to improve the mobile user experience and how to take advantage of the different unique features of a smartphone.

A remarkable result is the one of social media channel, with 59% of papers exploring its use from an eCommerce perspective and providing directions of future trends that will impact the channel. Many papers underline how social media radically changed how marketers advertise products and services, switching from TV-based advertising and physical billboards to online one, with the possibility to tailor marketing campaign based on customer characteristics. Furthermore, are identified many innovations related to the use of social media as a 1-to-1 direct relationship channel with customers, almost replacing the use of e-mails to engage and retain customers. Also, through social media retailers can create real digital stores and sell products, even without owning an eCommerce website and the related infrastructures and competences. Finally, social media are described as disruptive for their social characteristic, in fact retailer can exploit it and create affiliate programs, engage the most suitable influencers to promote specific products or services and also create a sense of community through special initiatives on the channel.

One of the most recent online channels are metaverse platforms, for example Roblox, The Sandbox and Decentraland. This element of novelty can also be found in the statistics related to the literature coverage, that is limited to 4 articles (10%). Park et al. [85] define metaverse as “an immersive online world in which users can interact with each other and their environments via virtual and augmented reality technologies” and also states that in the metaverse “users will interact in 3D spaces using holograms or avatars of themselves and engage in commercial exchanges using NFTs and cryptocurrencies”. Metaverse is the channel corresponding to the web3 ecosystem, that is the evolution of the web2, and the authors identify a series of innovations that will characterize the new online world and will become the new standard.

Despite most papers are strictly focused on the B2c eCommerce system, 47% of the literature tackle also different aspects and innovations related to the traditional store channel. Many of the innovations cited for online channels are simply reported in the physical one, with in-store digital applications.

About half of the papers present innovations related to omnichannel strategy. Omnichannel is the evolution of retailers' interaction with customers. In fact, the design of channel strategy moved from single channel, in which a retailer operates only with one channel, independently if it is physical or online [86]. This modality is the simplest to implement, in fact the effort to manage a single channel is lower than managing multiples and can be the less costly. At the same time this strategy reduces the potential customer base to only the users of that channel, having also impact in terms of customer flexibility and satisfaction. The direct evolution is the multi-channel strategy, in which multiple channels are used to get in contact with the highest possible number of customers. In this modality the different channels are managed by silos, and this can create problems in terms of data integration, service quality level and inconsistencies between the different channels [87]. The third evolution step is the cross-channel strategy, which involves the use of multiple channels and enables the customer to place an order from a channel and complete the purchase from another, as for example the very popular modality of buy-online pick-up in store. To conclude there is the omnichannel modality, that is indicated by researchers as the most recent and innovative modality. As the cross-channel modality, it enables the customer to place an order from a channel and then switch to another, but it adds an important element, the complete integration of all the different touchpoints that a customer can use in all the channels. In this way a customer can have the maximum level of flexibility, can engage with the advertising from a channel, after switch to another to find more information about the product, then complete the transaction and get the product from all different channels. Of course, this level of flexibility requires a great effort from the retailer that must digitalize and integrate all the product data, internal and external processes of the different channels [88].

2.2.3.9. Business Change

The next section of the framework is dedicated to business change, the papers are classified taking in consideration the different type of changes than the authors explicitly indicate as determined by innovations, or that are identified as necessary to effectively implement innovative solutions. Four main categories of business change are identified:

- *IT architecture*
- *Organizational*
- *Innovation type*
- *New competences*

In the Chart 2.14 is reported the distribution of papers in relation to the four business changes category identified.

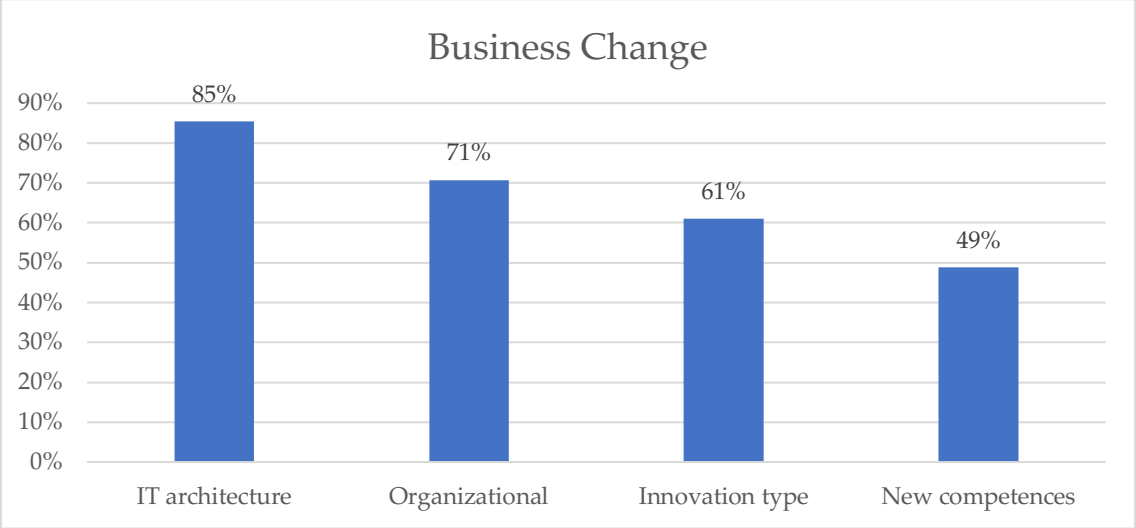

Chart 2.14: Distribution of papers based on business change dimension

As can be seen from the results, researchers typically introduce considerations about business changes when presenting innovative trends of the eCommerce industry. The most represented business change is the IT architecture, being present in 86% of the papers. This is related to the nature of eCommerce, being it based on internet technologies, and, also, because most of the presented innovations are technology-based and require infrastructural changes.

The second most represented category is the one of organizational changes, with 71% of the papers mentioning it. Often with the introduction of an innovation many internal and external elements of the organization have to be adapted, integrated or are affected by the new solution.

61% of the literature explicitly identify the type of innovation related to a new solution development.

The last category is related to new competences, being addressed by 49% of the papers. As we described in the section 1.1 to enable the effective design and implementation of a new business solution or technology, a set of key competences must be present in the organization or be outsourced from external entities.

In the framework each of these categories is in turn categorized and analysed.

Changes concerning IT architecture, can be of four different types:

- *Hardware*
- *Software*
- *Cloud adoption*
- *Data governance and cybersecurity*

The distribution of papers based on the different IT architecture categories is reported in the Chart 2.15.

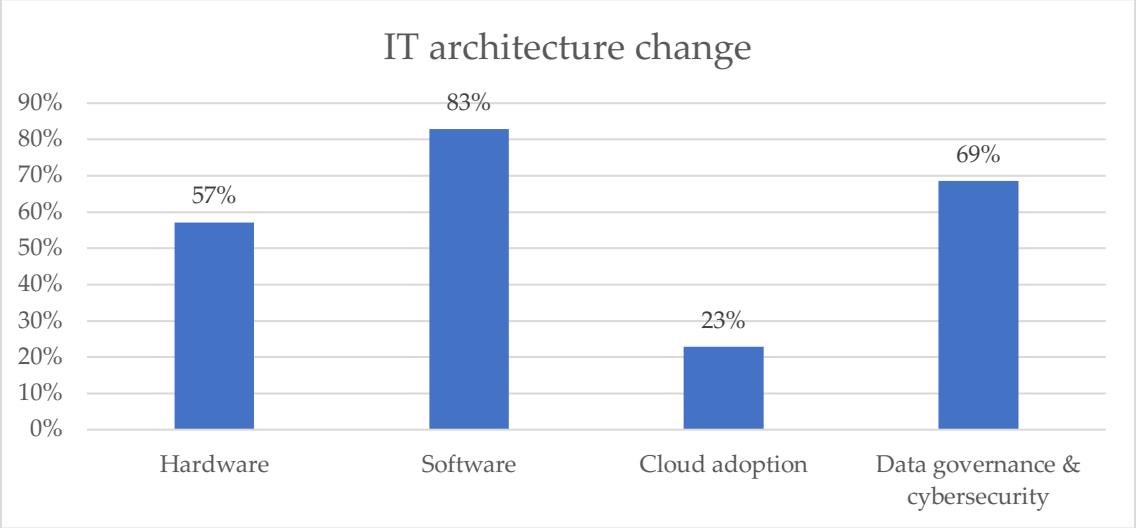

Chart 2.15: Distribution of papers based on IT architecture change dimension (over 35 papers)

In 57% of the papers, authors correlated to the introduction of an eCommerce innovative solution the need or suggestion to change the present hardware with more powerful, efficient, or intelligent one. Many types of hardware are addressed in the literature, for example IoT enablers for the digitalization of the supply chain, logistics, inventory and warehouse management (sensors, RFID tags, GPS trackers), last-generation servers and data centres, mainly used by large corporations, advanced routers and networking systems, to enable high speed connectivity, drones, robots and other automated machines, product returns and authentication systems, in-store technologies (smart displays, POS systems, mobile devices, biometric scanners and AR/VR hardware).

The most prominent category is software, with 83% of the papers making considerations on it. The advancement in eCommerce website functionalities and features, the development of AR and VR applications, and many other innovations that will be presented in the next section, require the introduction of new software, that can be produced internally, or outsourced from external partners with the use of APIs, service subscriptions and rents of entire systems.

As discussed in the section 1.4.2.3, retailers are increasingly entering the eCommerce business thanks to services provided by online platforms that operate using cloud computing to sell and share their solutions. In 23% of the papers the cloud computing transition is explicitly mentioned as an enabler of eCommerce innovation.

The last category is related to changes in the data governance and cybersecurity of online commerce businesses. In fact, many researchers (69%) underlines how customers and regulators are increasingly concerned about the acquisition, storage and use of the data related to customers. The first event that determined a change in

the activity of businesses related to customer data and privacy is the General Data Protection Regulation of the EU in 2016 [89]. After that event, many businesses and services providers changed their digital channels to be in line with the regulation, and a series of alternative tools and solutions emerged that provided same or better results to eCommerce businesses without break the law. Recently Apple first, with the release in 2017 of Intelligent Tracking Prevention [90], and Google after, with the announcement to become cookie-less from 2024 [91], radically changed how e-tailers can access and use customers data to enhance their marketing and personalization capabilities. These events have increased the number of innovative solutions designed for a cookie-less environment.

Looking at organizational changes, three different dimensions are identified in the literature:

- *Internal restructuring*
- *M&A*
- *Collaboration & Open Innovation*

In the Chart 2.16 are reported the results of the dimensional analysis.

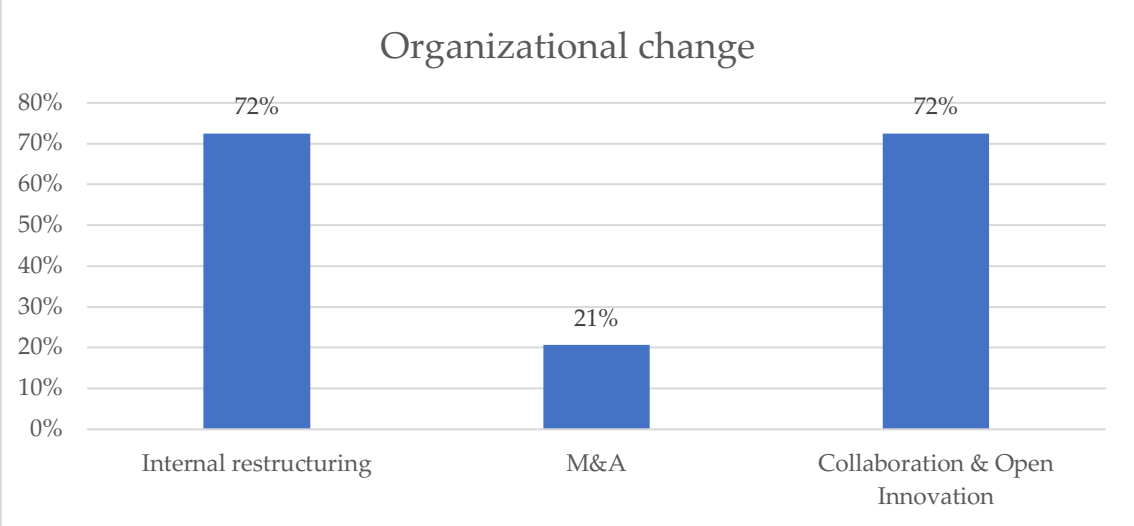

Chart 2.16: Distribution of papers based on organizational change dimension (over 29 papers)

The first organizational change introduced by the literature is internal restructuring, being present in a total of 21 papers. To this category belong all the organizational changes that impact the internal structure of a company, as the introduction of a new division, for example related to AR/VR application development or to Web3 activities, the creation of a new role, for example the prompt engineer for AI chatbots and applications, the design of new employee trainings, evaluation and benefit programs related to a new technology, and the re-engineering of processes to fit a new solution, for example new processes in the operation management with the introduction of click-and-collect, parcel-locker and other delivery services, and the creation of new way of working enabled by new systems.

Only 21% of papers introduce the concept of mergers and acquisition in discussing innovative trends in the B2c eCommerce landscape. M&A activities are usually described as an inorganic growth strategy, that aims to increase the value of a company by acquiring another business, that enables to diversify, gain new competences, access new technologies and intellectual property rights, exploit synergies and reduce competition and costs. In the paper "*Customer-Interfacing Retail Technologies in 2020 & Beyond: An Integrative Framework and Research Directions*" [92], Roggeveen et al. claim that "*many digital retailers are actively seeking ownership of retail technology firms, app developers, software companies, and drone manufacturers, as well as transportation and delivery service providers*". Two examples are reported by Shankar et al. [45], that states: "*Amazon's purchase of Kiva Robotics or Walmart's acquisition of Jet.com for their ecommerce platform are examples of such a decision. Perhaps, the retailing industry is like a "technology" industry. Retailing changes at the clock speed of technology, which suggests that retailers could use the strategies that technology companies adopt to avoid disruption*". M&A are complex activities that require the involvement of different actors and processes. This can translate in very high risks, related to preparation and execution of the financial operation, duplication of resources and difficulties in the cultural fit between the two entities. Some researchers noticed how the Covid-19 pandemic had a negative impact on the total number of M&A activities in the eCommerce industry [15].

The last organizational change identified by the literature is collaboration and open innovation, with 71% of the papers introducing it when discussing of innovative solutions. With collaboration researchers refers to the creation of business relations between different organizations. The actors involved in the collaboration can be two brands, with the release of an innovative co-branded product or service, a supplier and an eCommerce merchant, that integrates their systems and data to have a better overview on inventory, demand forecasts and the product handling along the supply chain, collaboration between eCommerce businesses and various service providers, that enable the development and release of innovative solutions. Open innovation is a particular type of collaboration between different entities, in particular is described as "*According to this model, start-ups, universities, and anyone who can bring ideas and enrich the wealth of skills and tools are involved*" [15]. In this model the focus is on the transfer of knowledge between different actors without limiting research and development activities only to firm boundaries. Many papers [40, 71, 41, 44, 15] report the creation of open innovation and R&D agreement between companies, corporate incubators and accelerators for start-ups, employee and start-ups hackathons, product and service co-creation with customers.

The literature review main focus is to understand which are the main innovative solutions that impact the B2c eCommerce value-chain, in this section are analysed which are the type of innovation explicitly identified by researchers. Two distinct categories are identified in the literature:

- Incremental innovation

- Other innovations

The results of the quantitative analysis are presented in the Chart 2.17

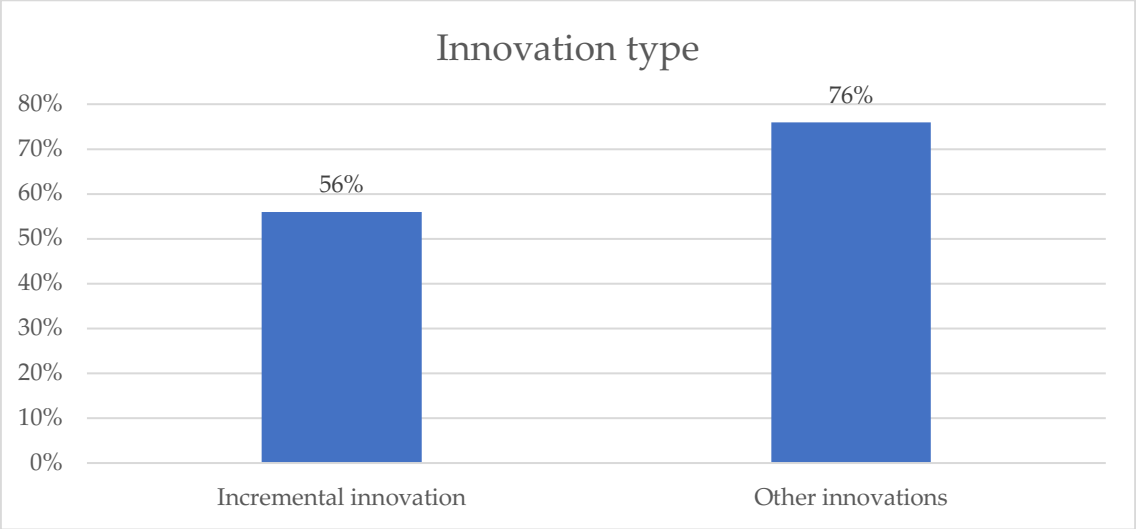

Chart 2.17: Distribution of papers based on innovation type (over 25 papers)

The data highlights how authors have a higher interest in exploring new solutions that disrupt the standard way to so things. Incremental innovations "*extend or technically improve existing products or processes*" [93], typically incremental innovations are related to generational developments of technologies and features, the architecture and the core of the solutions unaffected, but there is an increase in performance, features and usability. Incremental innovations are easily integrated in the existing system and their adoption, typically, does not present any obstacle. Examples of incremental innovations in the B2c eCommerce industry can be the introduction of an additional payment system, for example from card payments to system payments, or in the operation and logistic processes the switching from an old generation sensor to the next generation, or even the introduction of a new social media channel in the marketing strategy can be seen as an incremental innovation.

In the other innovation category, there all the innovations that are not incremental, that in the literature can be present as "disruptive innovations", "radical innovations", "breakthrough innovations" and "architectural innovations".

The concept of disruptive innovation was defined by two researchers of the Harvard University, in the paper "*Disruptive technologies: catching the wave*" [94]. The authors coined the term disruptive technologies to highlight a particular dynamic linked to the introduction of new products or services on the market, creating a disruption in the traditional way of doing things. Disruptive innovations, when introduced, have lower traditional performances in the short term than the technologies in use, but are able to offer a different "value proposition" to the markets. In the eCommerce sector, disruptive innovations can create new business models and revenue streams for merchants, enabling them to differentiate and be more competitive.

Radical innovations are described to "*have the power to make extant technologies immediately obsolete and require significant investments in skills, new knowledge, competencies, and capabilities for successful management*" [93].

Examples of these innovations in the eCommerce industry can be: the use of online marketplaces, new on-demand delivery services, subscription-based models, chatbots and virtual assistants, VR/AR applications and many others.

The last category of business change present in the literature is the one of competence change. It can be divided in two typologies:

- Technical competences
- Leadership and managerial competences

As showed in the Chart 2.18, the presence of technical competences topics in the literature in much higher than the one of leadership and managerial competences.

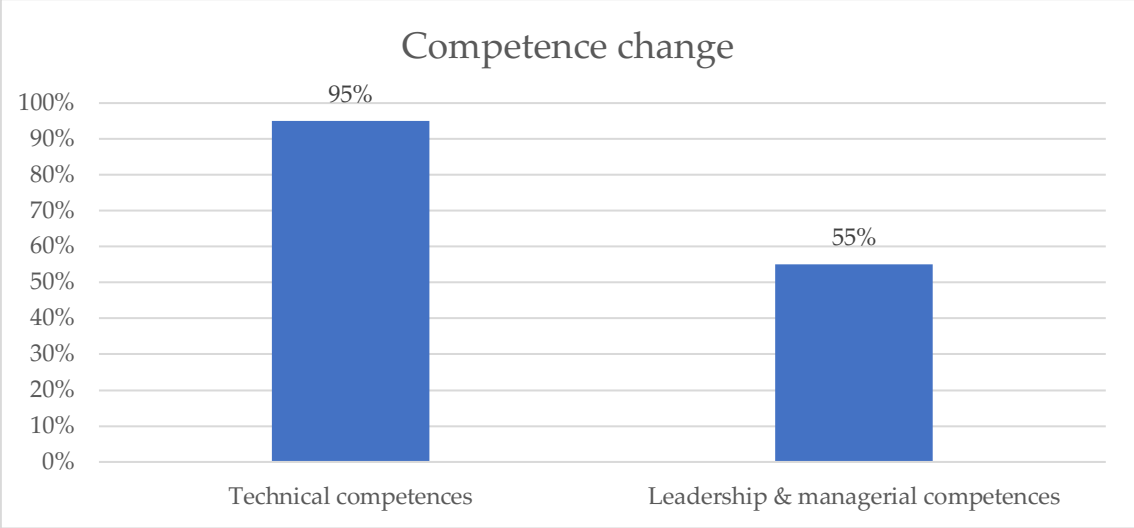

Chart 2.18: Distribution of papers based on competence change dimension (over 20 papers)

As seen in the section 1.1, eCommerce development, digital transformation of processes and introduction of new solutions, products and services require a complete set of new skills from both a technical perspective and a managerial one. In fact, new IT systems, technologies and processes requires employees to upskill themselves or the company to hire new professionals. At the same time, C-level executives and managers of the firm must understand what the impact on the overall productivity, efficiency, culture and competitiveness of the company can be, implementing new approaches to innovations and people management, creating an innovation-focused organization.

2.2.3.10. Value-Chain Innovation

The last category of the framework is related to the different innovations that are presented in the literature and their impact on the B2c eCommerce value-chain.

In the framework five different stages of the B2c eCommerce value-chain are identified:

- *Marketing:* in the marketing category there are all the different service and technology innovations that impact the advertising and marketing activities. In fact, new dynamics are affecting and changing the marketing space, in particular the use of multiple channels to reach customers, new type of advertising formats (photo, video, podcast…) and the different approaches to customer data usage. This category is present in 76% of the papers, ranking third in the literature.
- *Customer care:* it involves all innovations that impact the activities focused on engage, provide support and assistance to customers all along the customer journey. The topic, with operations & logistics, is the most frequent in the literature, with 88% of papers introducing one or more innovations related to it. As seen in the section 2.2.3.7, a good level of customer care is fundamental to enhance the customer experience, create long-term relationships and transform customers in the first promoters of the brand, establishing a competitive advantage in the sector.
- *Platforms:* this category includes all the technology related to the platformization of businesses and to the services provided through third party entities that enables the integration of other platforms (for example social networks) in the eCommerce system. Platforms counts for 61% of papers.
- *Payments:* eCommerce introduced electronics payments in the retail world, now the literature describe many new innovations related to payments systems and modalities, underling how customers can now choose from a variety of possibilities when purchasing a product. Innovations in the payments stage are discussed in 56% of the papers.
- *Operations & logistics:* as said before, these innovations are the most present in the analysed papers. In this stage, innovations are focused on optimizing internal and multi-actor processes that enable the correct functioning of the operations (cataloguing, warehousing, stocking, picking, managing the orders and the inventory) and the delivery of products to final customers.

Out of the 41 papers that compose the analysed literature, 16 of them present different innovations that impact all the five stages of the value-chain.

The results of this analysis underlines how innovations along all the five stages of the value chain are well-covered by the present literature, giving reliable indications about future trends that will characterize the industry.

The overall results of the analysis can be seen in the Chart 2.19.

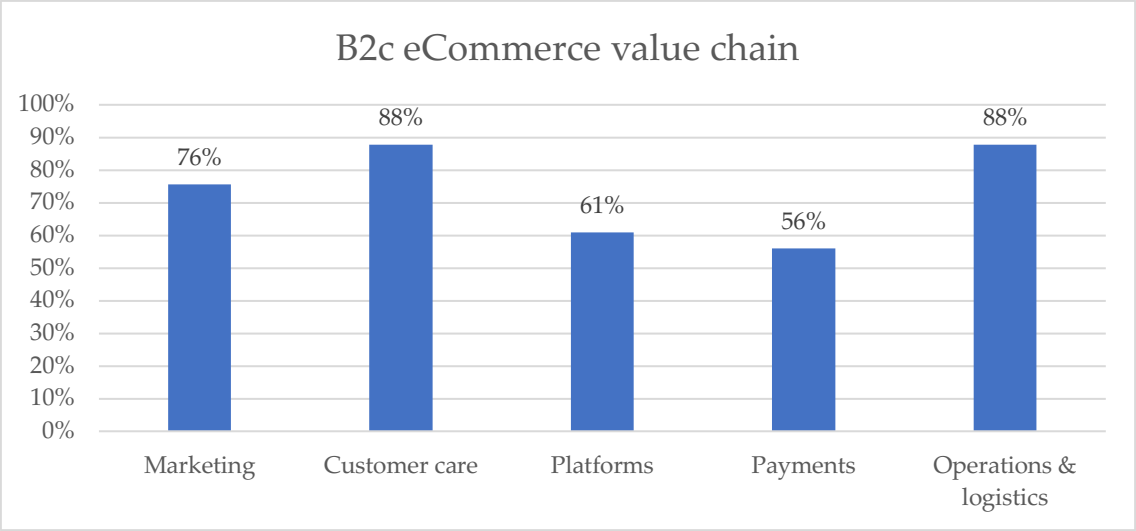

Chart 2.19: Distribution of papers based on steps of the B2c eCommerce value-chain

In the next paragraphs the different innovations that will shape the five value-chain steps will be presented and analysed.

Researchers identify many different technological and business solutions in the marketing segment that will characterize the B2c eCommerce present and future.

68% of papers presents advancements related to omnichannel marketing management, declaring it as the most researched in the category. Researchers describe different innovations, such as: central systems to verify and manage offering consistency between channels; management systems to prepare and upload advertising content from a unique view; software to dynamically optimize advertising spending in different communication channels; SEO optimization software for both search engines (for example Google) and marketplaces (for example Amazon); demand forecasting systems by channels, competitor monitoring systems (for both price and marketing activities). Another important tool, AI-enabled, is the sentiment analysis, which provide to merchants the capability to understand what the general feeling of an audience is, what are key insights coming from different channels and related corrective actions.

The second most cited innovation in the marketing step is price optimization, being present in 15 papers. The most present technique for price optimization is dynamic pricing, that through the combination of artificial intelligence and customer data related to past purchases, queries and location, enables businesses to instantly modify and adapt the price of a product or service to maximize the probability of purchase and the profit. Dynamic pricing is widely used in the tourism & travel sector, but different authors highlight how it is being adopted also in the consumer goods sector. Other price optimization tools that are being introduced in the B2c eCommerce are price negotiation, through the use of chats, and auction systems, that enables retailers, especially in the limited-edition segment, to sell products based on the real customer willingness to pay.

As mentioned in the chapter 1, social networks radically changed how businesses interact and communicate with their customer base. From social networks a new dominant figure in the communication domain emerged: the influencer. These actors operate on social media and promote different products and brands, but differently from traditional advertising. Influencers creates a direct relation with their community, the group of people that follow them, and provide specific suggestions that are in line with their image, and, consequently, with the interests of their community. In 26% of papers, authors highlight innovative solutions as influencer marketing platforms, which enables brands and influencers to match each-other. From the merchant perspective, these platforms enable to select influencers that have an audience in line with the target customers and monitor their communication performance during each campaign. From the influencer perspective, these platforms facilitate the acquisition of contracts that are in line with influencer image and could be appreciated by their fans.

Location based marketing solutions are mentioned in 26% of the marketing-related papers. This type of solution is particularly interesting for omnichannel retailers, in fact it enables businesses to reach customers with marketing contents based on their location. The typical case is when a customer is near to a store and receive application notification or other type of marketing content (mail, web-notification…), that invite him to discover the physical place or give him special time-limited discounts.

The least common innovations are web3 activations, with only 13% of papers presenting them. The law diffusion of the topic in the literature is strictly related to the newness of these initiatives. As described in the sections 1.4.2.6 and 2.2.3.8, web3 is seen by some authors as the next evolution of internet technology. It will have house impacts on the eCommerce industry and many innovations will alter the present business models and processes. As reported by [82] "*NFTs can also be used to incentivize community members, provide special access to events, offer exclusivity, and even provide business services*" and "*NFT collections are also released by big corporations such as Coca-Cola, Adidas etc. for their branding, business activities and charity*".

In the Chart 2.20 are summarized the results of the literature analysis.

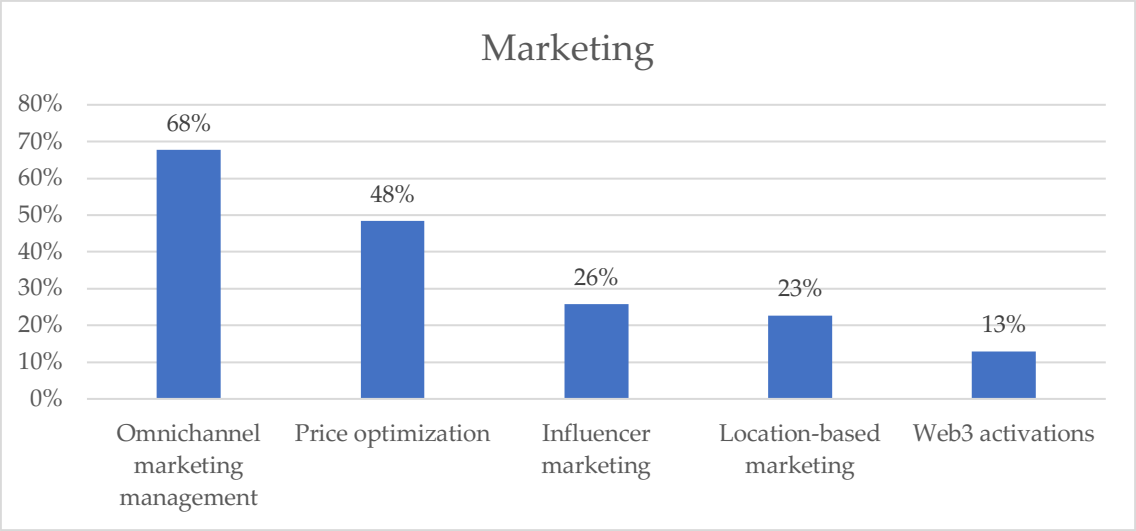

Chart 2.20: Distribution of papers based on marketing innovation (over 31 papers)

Looking at the customer care innovations, authors explored a very broad selection of solutions, that combine many of the emerging technologies seen in the section 1.4.2.

Immersive services are the most explored innovation by the literature, with 25 papers discussing these innovations. In this category there are all the different innovative solution that provide to the customer an immersive shopping experience. As seen in described in the first chapter, AR and VR technologies enabled the creation of new experiences with both already existing hardware, such as smartphones, and new one, such as VR headsets, AR glasses and other smart wearables. One of the most described applications of these technologies is virtual-try-on (VTO). Though the use of augmented or virtual reality, it enables customers to try products without physically having them. Its diffusion is mainly in fashion & accessories, beauty and personal care and furniture and home décor segments, in which the physical appearance of products is a key element in the purchasing decision. In the travel and tourism sector instead, virtual services are used to enable customers to explore what will be the experience in a more realistic way. Finally, many researchers describe how online customer assistance services, can be enhanced with the use of immersive technologies, improving current one-to-one and one-to-many assistance services provided through phone calls, e-mails and other tools, connecting customers directly to product experts and store assistant.

The second most present innovation in the literature is recommendations, which appears in 67% of the publications. This solution exploits customer data and artificial intelligence to provide purchase and use recommendation to potential customers, change the website interface to be in line with customer preference, increasing the probability of purchase and simplifying the research and discovery phase of the customer journey. Application of this innovation are emerging in all the eCommerce sectors, improving the ability of retailers to cross and up-sell products to customers, even in a cookie-less environment, with dynamic recommendations.

The customer data platform (CDP) and the customer relationship management (CRM) systems are powerful tools for both the customer care and marketing activities of an eCommerce business. In the literature, the topic is explored by 64% of the papers in the customer care category. The customer data platform is the fundamental back-end system to extract, store and manage in an optimal way data related to customers. The two innovations, are able to produce a unique view of the consumer and create persistent identities, affecting the customer engagement and loyalty stage of the customer experience. By offering a cohesive and granular representation of customer data and information, they enable every business function to deliver personalized, effective and uniform experiences, from after-sale services to product development.

As said in the section 1.4.1, automation can have many positive impacts in terms of efficiency and effectiveness of process and services. 61% of the researches considered present the innovative topic of automated customer service. The most frequent solution is the one of chatbot, also referred to as virtual assistant. First version of chatbots were enabled by decision tree models and are often known as "rule-based" chatbots. Recent developments in machine learning and artificial intelligence enabled the creation of modern chatbots based on natural langue processing (NLP). This technology makes chatbot conversation much more human-like, increasing the quality level of responses and eliminating the effort in mapping all the possible cases in the decision tree.

58% of the papers introduce the importance of personalization services in the B2c eCommerce industry. In this category there are solutions like 3D product configurators, co-creation and made-to-measure services. In fact, customers increasingly demand, to both retailers and manufacturers, higher levels of personalization and customization of products and services. Through 3D rendering, digitalization of the entire catalogue and components, businesses can provide tailored products or features and enable customers to create themselves their unique piece.

With community and reviews academics identify the innovative solutions that impact on reviews systems of websites and applications. Merchants increasingly include review sections and ratings in product pages, through which customers can increase the level of knowledge of a product and the trust in a vendor. It is particularly useful in marketplaces, where customers can compare different alternative products, brands and vendors, but is also introduced by many DTC brands. From the brand perspective, review systems can be combined with AI sentiment analysis tools to get feedbacks and insights about a product or service. Furthermore, peer-to-peer video-reviews and consultancy is incentivized by merchants and websites, with rewards. Finally, loyalty programs and gamification systems are discussed in many of the cited papers as powerful solutions to engage with the customers and increase repeated purchases.

The last innovative category related to customer care are innovations that involves voice interaction, analysed by 39% of the authors. New voice interfaces of smartphones

and other electronic devices, such as smart speakers, enabled eCommerce businesses to create new services and experiences based on voice interaction, such as voice virtual assistants, and many players are enabling online purchases through the use of voice interaction, as in the case of Amazon Alexa.

In the Chart 2.21 are reported key statistics about the just mentioned innovations.

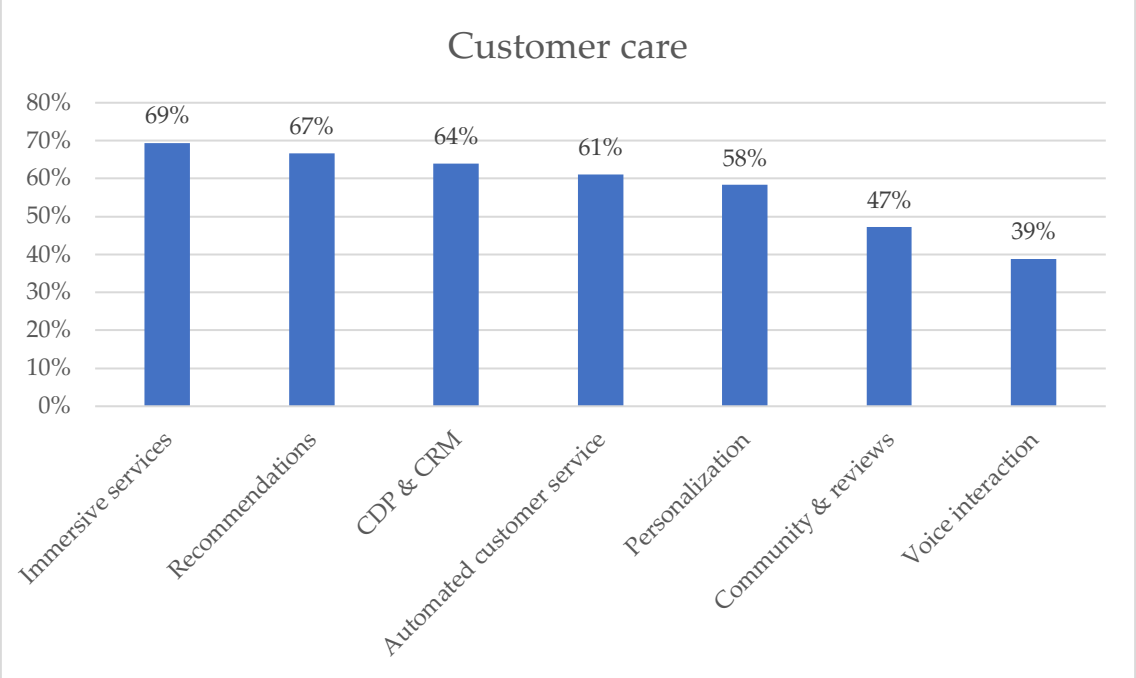

Chart 2.21: Distribution of papers based on customer care innovation (over 36 papers)

The next innovation group identified in the literature is the one of platforms, with two main solution categories: platform development and social commerce.

The first category is described by 72% of the papers. As discussed in the previous sections, the diffusion of cloud computing technology and eCommerce platforms enable small businesses to add many services and advanced online features through the use of APIs. In addition, eCommerce businesses can now transition to platform models in a simpler way, enabling the creation of internal marketplaces, affiliate selling and second-hand platforms directly inside proprietary eCommerce.

Social commerce refers to all the solutions that enable merchants to sell products and manage orders, communications and post-sale services directly inside social platforms, like WhatsApp, Facebook, Instagram and TikTok. Strictly related to social commerce is live-shopping, an eCommerce model that enable brands and influencers to host livestreaming on different social networks and branded websites or applications, directly interacting with the audience, present products catalogue and sell to consumers on the livestream interface. Shoppable videos are another element of platforms innovation, many solutions enable brands to sell products inside advertising and presentation video, through the use of AI image recognition and one-click-buy.

The distribution of papers related to Platforms innovation is reported in the Chart 2.22.

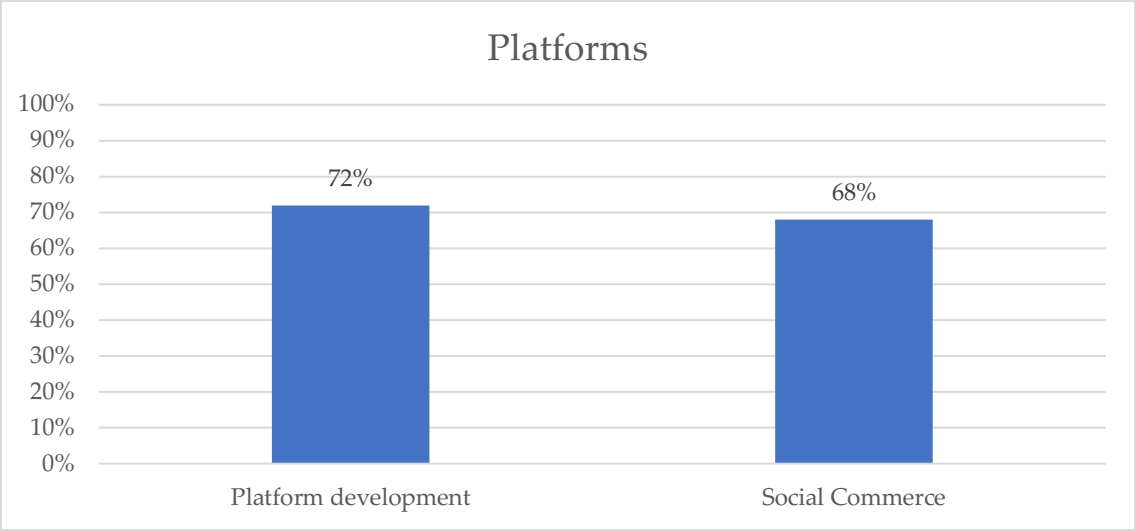

Chart 2.22: Distribution of papers based on platforms innovation

One of the key processes in online commerce is the payment phase. Innovations related to this phase are presented in the next paragraph.

61% of the studies presents innovations related to security systems for online transactions. Most cited innovations regard: biometric authentication payments, in which the transaction is approved through the use of biometric data as face recognition or fingerprint; real-time fraud detection, that use machine learning models and behavioural analysis to understand if a transaction is fraudulent or not; payment tokenization, new customer data encryption models and direct bank payment are other solutions introduced in the theme of security system innovations.

In the section 1.4.2.6, blockchain is presented as an emerging technology that can disrupt many industries and processes, regarding the payments environment many authors (52%) introduced the concept of crypto-payment. Blockchain enabled the creation of decentralized systems in which transactions are managed through cryptocurrencies, digital currencies that eliminates the needs of intermediaries and provide secure transaction environments. With the diffusion of Bitcoin in the financial sector, many customers stored financial assets under the form of cryptocurrencies. E-tailers and payment service providers are updating their systems to accept purchases in cryptocurrencies.

With the diffusion of mobile commerce, and consequently mobile payment, digital wallets have emerged as an effective solution for eCommerce. They enable customers to store financial information and any type of card in an application, to simplify the payment process though smartphones and computers. 48% of the papers explore the topic of digital wallets.

Finally, three additional innovations are introduced by the literature: digital receipts and invoices (26% of the papers), enables retailers to digitalize proof of payments and product assurances, with an increased usability for customers; buy-now-pay-later

systems, that enables customers to purchase products and services (in particular very expensive items) paying in multiple instalments without any interest fee, in fact interests are charged to the merchant (that receive instantly all the money) by the service provider, this type of system increase the conversion rate and total sales of retailers, both online and in-store; subscription model enable standard product and services of an online commerce to be bundled, through the use of AI, and sold to customers with a subscription-based modality, or products like fashion, furniture and electronics, are rented by the merchant to subscribers.

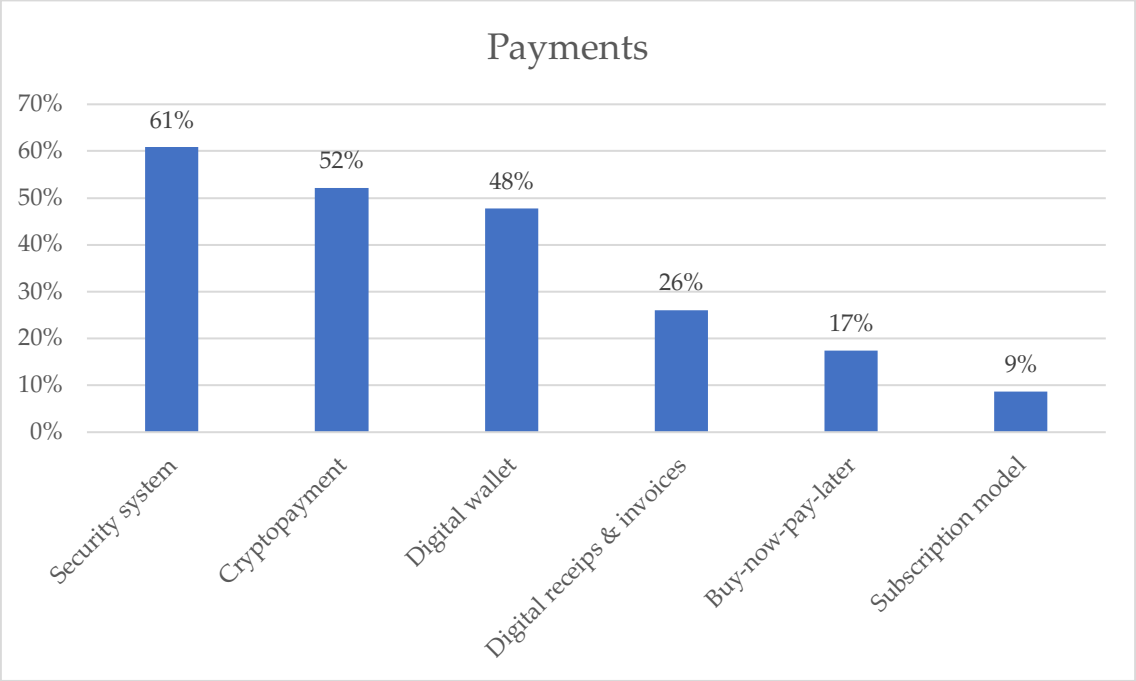

Chart 2.23: Distribution of papers based on payments innovation

In the end, the literature presents a huge number of innovations related to operations and logistics.

The most present innovation category in the literature is warehouse management, with 69% of the papers analysing it future developments. An efficient and effective conduct of storing, handling and picking operations is vital for the survival and profitability of eCommerce businesses, in fact rapidity and precision of these operations indirectly impact the customer perception of the service. Modern and future warehouses re describe in the literature as IoT enabled, through the use of multiple sensors and monitoring systems, energy efficient, with many tools to save energy and limit wastes. Operators in the warehouse will be enhanced through the use of AR and VR technologies, to help them find products and see liver virtual information. Artificial intelligence enabled more powerful forecasting abilities and live optimization of the inventories, enabling retailers to manage multiple warehouses and stores in a unique view, automate replenishment and manage increasing numbers of product variants and components required for personalized shopping. Also, robots, drones and other smart machines will be used to automate the operations. Finally, warehouse

distribution system of warehouses will change, from large central deposits to micro-fulfilment centres, co-owned warehouses and dark stores.

In the second place (67% of papers), there are order and delivery management innovations. Innovative order management systems, in combination with warehouse management systems, can provide endless aisle view of all the different products that are in inside company processes (from the in-bound logistics to warehouse, courier' vehicle, eventually store and finally to the customer). Advanced live-tracking systems and sensors enables to know exactly where the product is, enabling the customer to be updated on progresses and make changes to the order in every moment. Another important innovation is the route optimization, through which both e-tailers and logistic providers can optimize the path of their couriers in both cost and sustainability terms.

As reported by 58% of the authors, through the use of blockchain technology the entire supply chain can improve the level of transparency of their operations and products. Each of the resources and processes involved in the production, storing and delivery of a product can be immutably linked to the product and provide important information to the customer in a reliable way, eliminating the problem of green-washing and counterfeiting.

Quick delivery innovations are a particularly addressed topic by researchers, with 20 papers in total. In this category are present the different delivery methods of the quick commerce, in particular 1-hour delivery, same-day deliver and delivery on appointment. Also, innovative logistic service platforms enable to deliver through gig economy couriers and crowd-shipping (cited in 7 papers), also, different AI tools enable to compare and choose the optimal partner for each delivery in terms of cost, time and sustainability.

Click and collect (42% of papers) is an innovative method that enables customers to purchase a good online and retire it from the store of the merchant. An evolution of the click and collect method are parcel lockers (28% of the papers) and home & trunk delivery access (17% of papers). First ones have seen a large diffusion in latest years, instead home and trunk access systems, at the moment, are not perceived by customers as safe and need improvement in IoT, sensors and security systems [95].

Authors, in 33% of papers, also explore the topic of sustainable and interactive packaging applications, such as re-usable packaging, biodegradable and alternative materials, refillable containers for beauty and healthcare products and smart packaging with NFC capability or QR code augmented features.

Three categories that are seeing increasingly interest from academic research and business applications are the use of robots (31%), drones (22%) and autonomous vehicles (19%). All these three categories can be used inside the warehouse, to manage products and automate operations, and for last-mile logistics, to automate the delivery of products, save money on employees and guarantee 24h service availability.

Autonomous vehicles are also presented as a possible solution for long distance transportation in the future.

Finally, online commerce enables customers to purchase products, try them after the delivery and if not satisfied, return them to the e-tailer. The literature (22%) describe how different solutions are being developed to facilitate the return processes of the buyer, encourage the customer to purchase other products instead of asking a refund and verify the authenticity and quality of a returned product with AI and blockchain, in particular in the luxury sector.

The literature interest in the operations and logistics innovations is reported in the Chart 2.24.

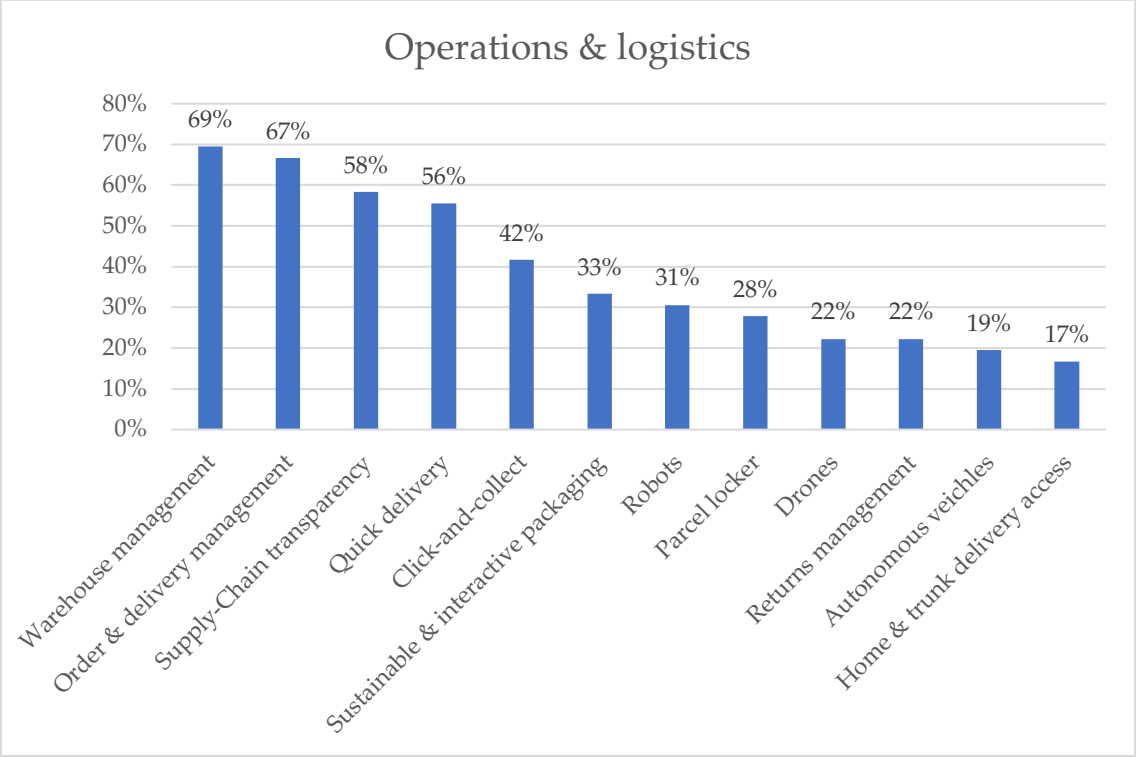

Chart 2.24: Distribution of papers based on operations & logistics innovation

3 Analysis of innovative start-ups of the B2c eCommerce value-chain

3.1. Introduction

In the first two chapters of the thesis the B2c eCommerce industry has been presented and the literature was explored and quantitively analysed to understand which will be the future developments and innovations of the sector.

From an innovation perspective, three key elements were identified that will determine the evolution of the B2c eCommerce value chain:

- *Technology*
- *Service Providers*
- *Start-ups and Open innovation*

Starting from these considerations, this chapter aims to understand and provide a complete overview of the present worldwide ecosystem of innovative start-ups that provide technology, services and other solutions to eCommerce businesses, from a quantitative perspective.

Other studies [96, 97, 98] in the literature quantitively analysed eCommerce adoption by start-ups, and their role in the dynamics of merchant and platform competition. However, within the known literature, there is no study which analyse the current global context of start-up service providers oh the eCommerce B2c, and from which derive useful indications of the innovations that will characterise the coming years.

Representing the current innovative environment of service provider start-ups can anticipate future standard services of the B2c eCommerce and give useful insights to retailers, technology businesses and investors about what will be the trends that will shape the industry.

In the analysis will be explored the geographical distribution of innovative start-ups, what are the main sectors of businesses that they serve, which steps of the B2c eCommerce value-chain are the most attractive for start-ups, in which specific technologies and solutions start-ups are focusing their efforts and how investors are investing in the funding of innovative start-ups.

As the first step of the quantitative analysis, the scientific methodology has to defined in a clear and reproducible way.

3.2. Methodology

To determine which are the innovative start-ups that will be analysed, it was needed a comprehensive database with main information related to start-ups.

Start-ups, that usually are not publicly traded companies, are not subject to regulations regarding the publication of financial statements. Therefore, information about their activities must be collected from other sources. In this study, data and information were gathered from Crunchbase. Crunchbase is the leading provider of private company prospecting and research solutions, in particular for new-born businesses, counting more than 75 million users. Provided business information includes websites, contacts, fundings status and industry affiliation [99].

After having defined the data source, a usable database has to be created with all the start-ups that are of interest for the study. Crunchbase enables the selection of data through the use of different filters. A series of criteria have to be defined to correctly select start-ups and enable the reproducibility of the results. Following the definition provided in the section 2.2.3.5, start-ups are young innovative businesses that are searching a repeatable and scalable business model and their operations are financed through external investments.

Based on the mentioned consideration, the following criteria are defined:

- The legal entity has to be founded in the last five years (from 31st March 2018 on)
- The start-up must have received at least one funding in the last two years (from 31 March 2021 on)
- The start-up is actively operating in the market

In addition to these criteria related to the definition of start-up, other filters have to be inserted to limit the scope of the research to businesses that are provider of innovative services, technologies or solutions to B2c eCommerce companies. Being the research filter related to the clients of the start-ups of interest, industry tag cannot be used, because they will exclude many potential start-ups of interests, categorized in other industries. Therefore, the research was conducted by keywords and tags, in which were included the different innovative solutions that are described in the literature, in the chapter 2.

These criteria resulted in an initial database. To limit the analysis only to start-ups effectively serving the B2c eCommerce industry and to verify their active status, all the start-ups were manually checked, using as primary source website provided on Crunchbase, then LinkedIn accounts and in the end other social media. To determine if a start-up is in line with the research objective, it should explicitly report information about the B2c eCommerce clients, or present use cases or case studies directly involving B2c eCommerce. In this process all the non-relevant companies are

eliminated from the database and relevant ones were classified following the framework that will be presented in the next section. Additionally, every time new solutions are identified during the selection, iterative research process has been implemented and the analysis framework updated, resulting in a final total database of 3775 start-ups.

After the selection process 1036 suitable start-ups are identified and selected inside a Microsoft Excel database.

3.3. Analysis framework & classification

After having selected the database, different information about the companies are extracted from Crunchbase. All the data on the website are directly provided by start-up founders or other employees, for this reason, it is possible that some data are not updated or even missing. In the case of missing data, they are categorized as "*non-disclosed*". It is also important to mention that, if the same research is repeated in another with a time lag it is possible that many of the data, characteristics or even business models and industry of reference will be changed, due to the nature of start-ups, that are fast evolving entities.

In addition to the company profile, a structured framework was created to analyse what type of innovations start-ups provide to the eCommerce industry, and then, elaborate statistics and insights with these data.

In total, the framework is composed by six main sections that explore different aspects of the business:

- *Company profile:* in this first section general information about the start-up are reported, its name and references, information about the founding team and the country of origin.
- *Funding:* Crunchbase reports a lot of different data regarding fundings, the most important to evaluate are related to financial value of the fundings, that is reported in US dollars, but in many cases is in another currency and is converted, the funding source and their type.
- *Industry served:* refers to the sector in which the start-up's customers operate, the sectors identified are the same as in section 2.2.3.3, plus there is the others sector, for all those solutions designed for other companies in the B2c sector (such as publishing and insurances).
- *Channel:* in this section, start-ups are categorized according to the channels in which their innovations and services are used or on which they impact. Categories are the same of the one presented in 2.2.3.8, except for the introduction of e-mail and elimination of store (integrated in omnichannel)
- *B2c eCommerce value-chain:* there are the same five steps identified and described in the section 2.2.3.10.

To provide a comprehensive overview of the study, in Figure 3.1 and Figure 3.2 is reported the classification framework used in the analysis.

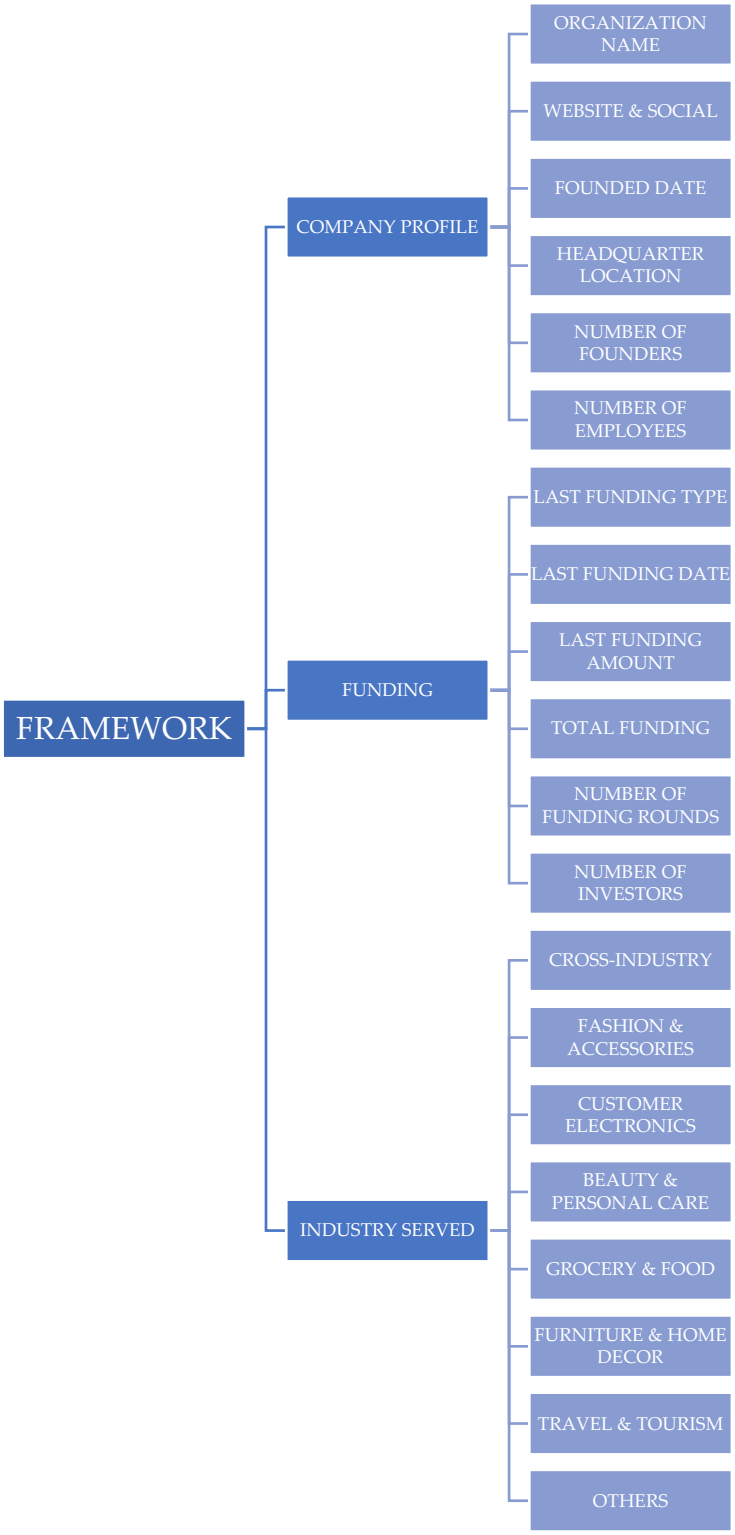

Figure 3.1: Start-ups classification framework (1)

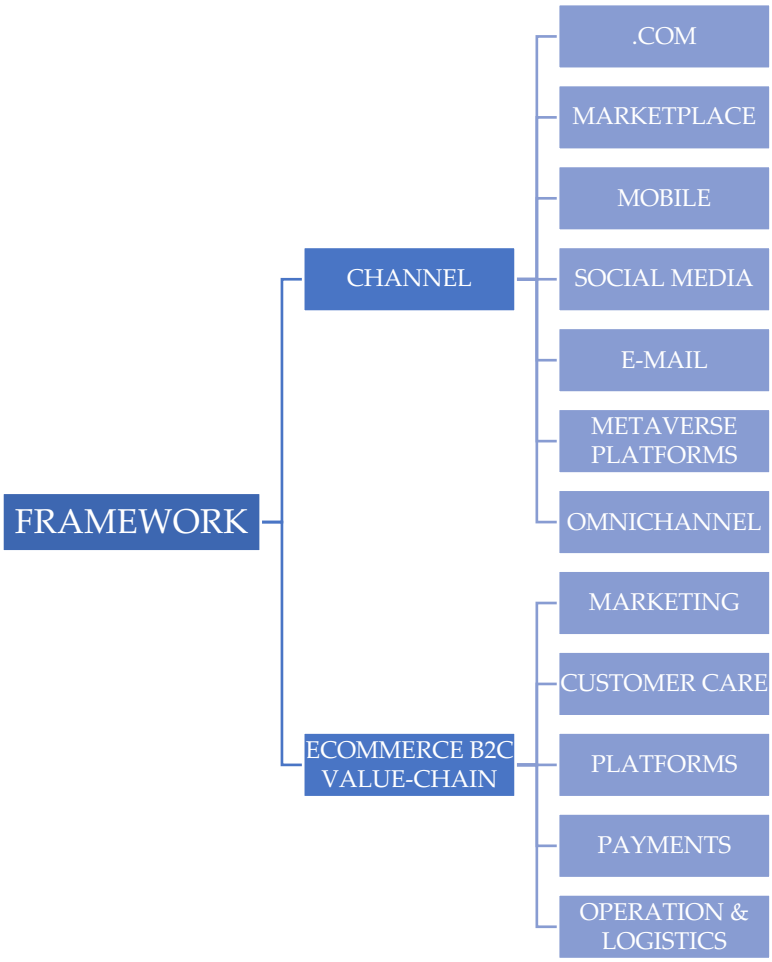

Figure 3.2: Start-ups classification framework (2)

Additionally, to execute the analysis in the most precise as possible way, a total of 40 specific recurrent innovative solutions were identified to improve the classification of start-ups. Furthermore, the classification by solution can assume a practical utility for researchers and eCommerce professionals, providing a useful database to quickly select specific start-ups based on the solution needed.

In the quantitative analysis sections only interesting statistics about some of the specific technologies will be reported and commented.

If not specified in the chart's caption, all the statistics presented in % are referred to a sample base of 1036 start-ups.

3.4. Quantitative analysis

In this first section, are presented general quantitative data and insights about the global landscape of start-ups that provide innovative solutions and services to B2c eCommerce businesses.

Looking at the foundation year of start-ups over the past six years, an interesting trend can be identified. The number of companies is more than tripled from 2018 to 2020, going from 94 to 293 start-ups founded. This outstanding growth could be attributed to the impact of Covid-19 pandemic in the adoption of eCommerce as the purchase channel by consumers in the retail market, as seen in the section 2.2.3.5. In 2021 the number of founded start-ups slightly decreased to 265, dropping to just 104 foundations in 2022. This decline could indicate first a stabilization of the service provider market and after, probably due to increased competition and the stabilization of online sales, seen in the section 1.3.1.2, a saturation of the total market. For what regards 2023, only data related to the first 3 months of 2023 are available, indicating a total of 10 new ventures in the sector, with an estimated monthly rate of founding of 3.33, a much lower value if compared to the average rate of 18, related to the previous 5 years.

Summary data can be seen in the Chart 3.1.

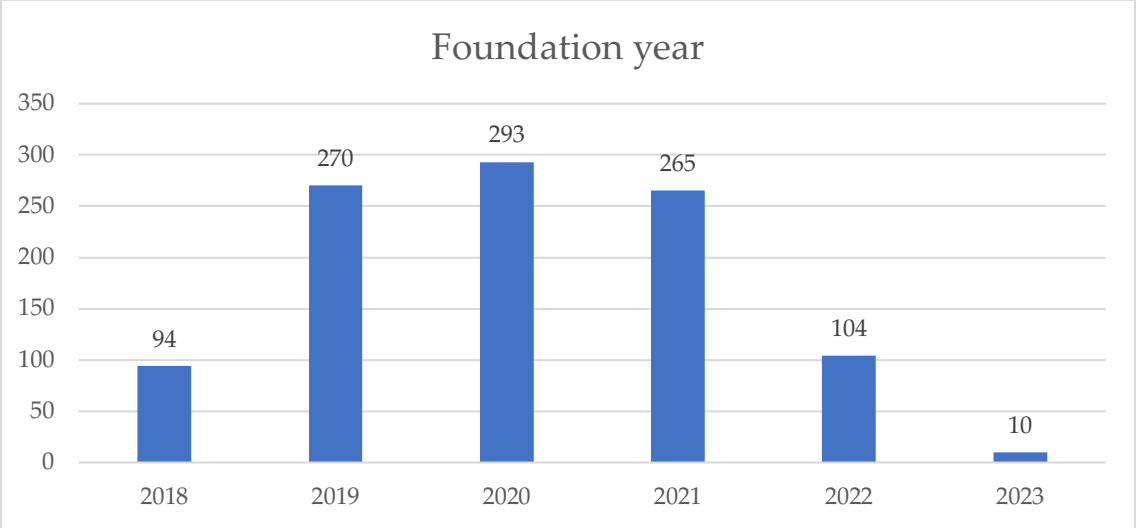

Chart 3.1: Distribution of start-ups based on founding year

In addition to this analysis some considerations and limitations must be discussed:

- Survivorship bias: in the paper "*The financing of business start-ups*" [100], the author state that "*survivorship bias is the bias caused by sample firms not being representative of the population of firms at the time of start-up. The surviving firms may have different characteristics including financing to the firms that have since ''died,'' that may have influenced firm survival and failure between the period of start-up and the point of survey*". This is strictly related to the active status of selected start-ups, for this reason it should be possible that the number of total start-ups founded is distributed in a different way.
- Impact of the last funding date: one of the selection criteria consists in having received a funding in the last two years, this can eliminate from the view start-ups that were funded in the first years of that study and that were able to scale

their business very quickly and become independent from external financing. At the same time, recently founded start-ups that have not already received a financing are not considered in the data.

After having presented the distribution of start-ups according to year of foundation, it can be useful to explore how start-ups are created by their founders.

A first distinction that can be made is between solo-founders and teams. 27% of the selected start-ups are founded by a single person, instead 73% of the business are created by teams composed of 2 or more people. These figures highlight how much business comes from the collaboration of several people in a project. Looking into the teams, it can be noticed how most of them, corresponding to 338 new ventures, are composed by two founders. Furthermore, to an increase in the size of the team, correspond a decrease in the number of start-ups, highlighting how difficult can be to start a project with too many people involved in it.

The distribution of start-ups based on the founding team is provided in the Chart 3.2.

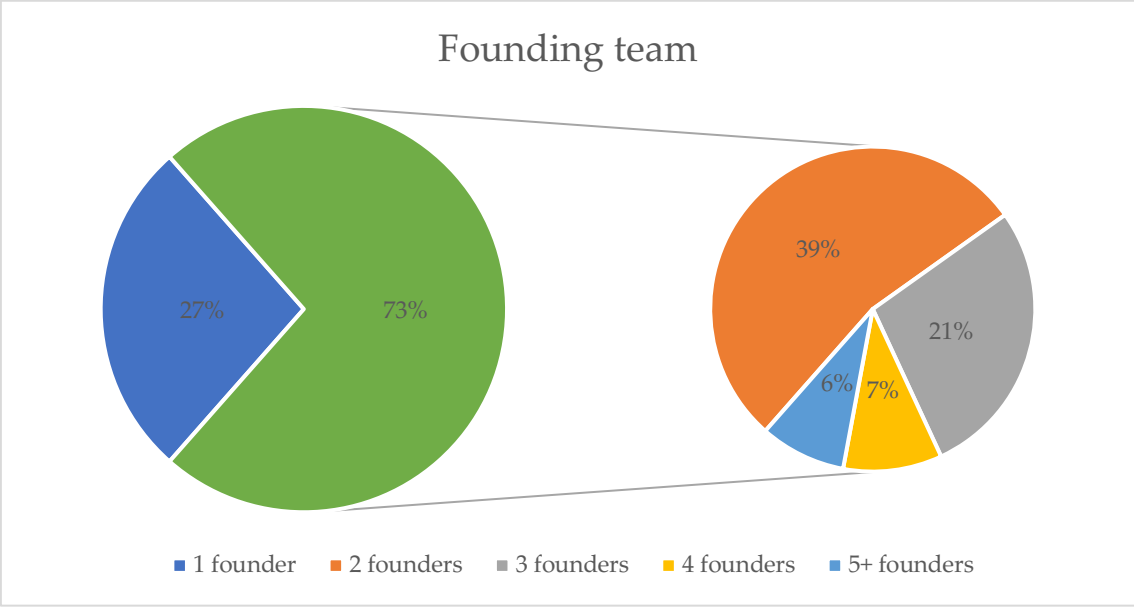

Chart 3.2: Distribution of start-ups based on the number of founders

The dimension of the founding team generates a trade-off between:

- The level of coordination required to manage the team, the decisional agility and the flexibility in managing and selling equity shares.
- The variety of competences, skills and resources available, both tangible (financials, physical) and intangible (access to networks of investors and similar professionals) and synergies in combining different views.

Different recent studies [101, 102], analysed the correlation between the configuration of the founding team (solo entrepreneurs vs cofounders' teams) on the survival and success of the new ventures. Despite the common belief that teams perform better than

individual founders, their results showed that the latter manage to make their companies survive longer and achieve higher total revenues than teams founded by couples and achieve similar results to the one of larger teams.

Looking at start-ups solution providers of the B2c eCommerce industry, most of the founders are following the pair configuration, that according to the cited studies is the riskiest one.

The level of entrepreneurship is very different around the world, with countries that are more active in the start-up environment and countries that lag behind. Looking at the service provider of this study, the data showed in the Chart 3.3 confirm the big difference that there is.

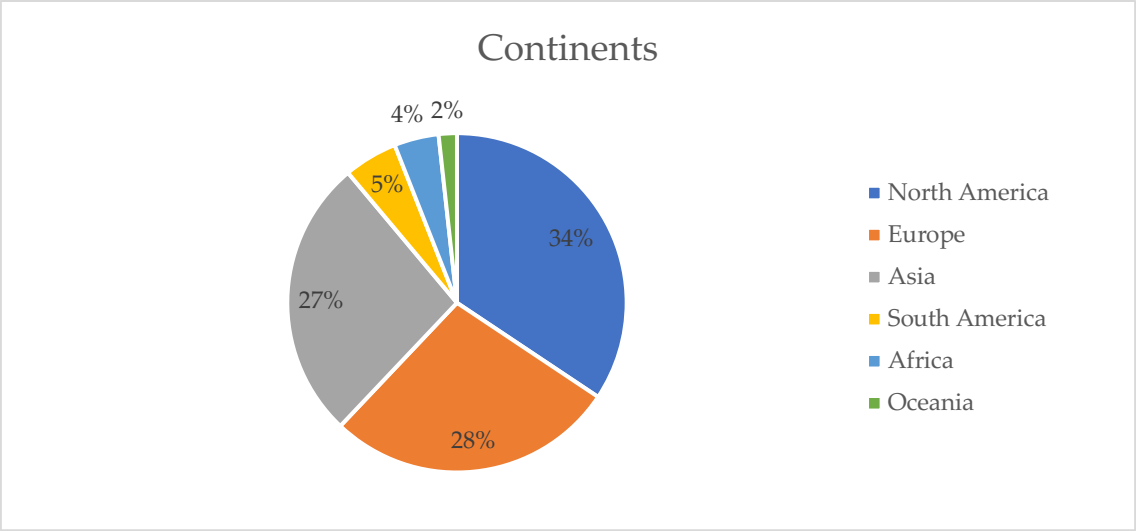

Chart 3.3: Distribution of start-ups based on continent of origin

North America, comprising only USA, Canada and Mexico, has the leader position for new ventures founded, with 34% of the total. The region is dominated by USA, that is famous for its start-up culture and the high diffusion of innovation hubs and Venture Capital firms, with Silicon Valley being the central reference for technological advancements and entrepreneurial activities.

Then there are Europe and Asia, with a similar number of start-ups, with 287 and 278 businesses respectively. In these regions, the level of concentration of start-ups is lower, highlighting multiple innovation centres often connected to form a diffuse network.

Finally, the last three regions (South America, Africa and Oceania) have a much lower impact on the total distribution of start-ups. Concerning South America and Africa, these levels are to be attributed to multiple causes: the low levels of financial investments in the area combined with lower diffusion of internet access and smartphones in combination with a low level of purchasing power coming from

customers. In the case of Oceania, the number of start-ups is strictly related to the population of the area, being the continent populated by only 44.5 million people [103].

For what regards single countries, in total 74 different countries are identified with at least one start-up headquartered in the nation. The average number of start-ups based in a country is 14, instead, the median value is 4 and a standard deviation of 39.34, highlighting a high variability in the distribution of start-ups between the different countries, mainly caused by the outlier data referred to USA. In fact, the nation counts for almost the totality of the start-ups in North America, corresponding to 31.8% of the total start-ups included in the study. In the **Error! Reference source not found.** is reported the list of the first 20 countries by number of new ventures.

Rank	Nation	N° of start-ups	Rank	Nation	N° of start-ups
1	USA	329	**11**	Brazil	20
2	India	73	**12**	Australia	18
3	UK	54	**13**	China	17
4	Germany	44	**14**	Sweden	17
5	Singapore	36	**15**	Netherlands	16
6	France	33	**16**	Nigeria	16
7	Saudi Arabia	30	**17**	Turkey	15
8	Israel	28	**18**	Canada	13
9	UAE	26	**19**	Egypt	13
10	Spain	21	**20**	Mexico	13

Table 3.1: Top 20 countries by number of start-ups

In addition to this analysis some considerations and limitations have to be discussed:

- *Linguistic problem*: the results of Asian and African countries can be affected by the selection phase of the start-ups, in fact in many cases website presented languages that use letters different from the Latin ones, causing problems in the translation. Also, the tags and keyword research in the database can be affected by the language, reducing the number of companies related to these geographic areas.

- *Crunchbase limits*: the company states "*It's likely that as a U.S.-based company, its data quality and comprehensiveness are skewed to favor the U.S., which is by far the largest venture capital market in the world. It's generally believed that Crunchbase's private company data for the rest of North America and for Europe is quite thorough as well. While constantly being improved and added to, data for companies in other parts of the world is likely somewhat less comprehensive*" [104], highlighting how data about developing countries can be missing.

Another important aspect of new ventures is related to the maturity of the organizational structure and how many professionals the different companies employ. As can be seen in the Chart 3.4: Distribution of start-ups based on number of employees, many start-ups (39%) are in the early stage of their growing path, employing less than 10 people, in this phase founders and other collaborators are handymen that do every tasks and activity without a strictly defined role, the coordination happen in an informal way and day-to-day collaboration and updates are often required.

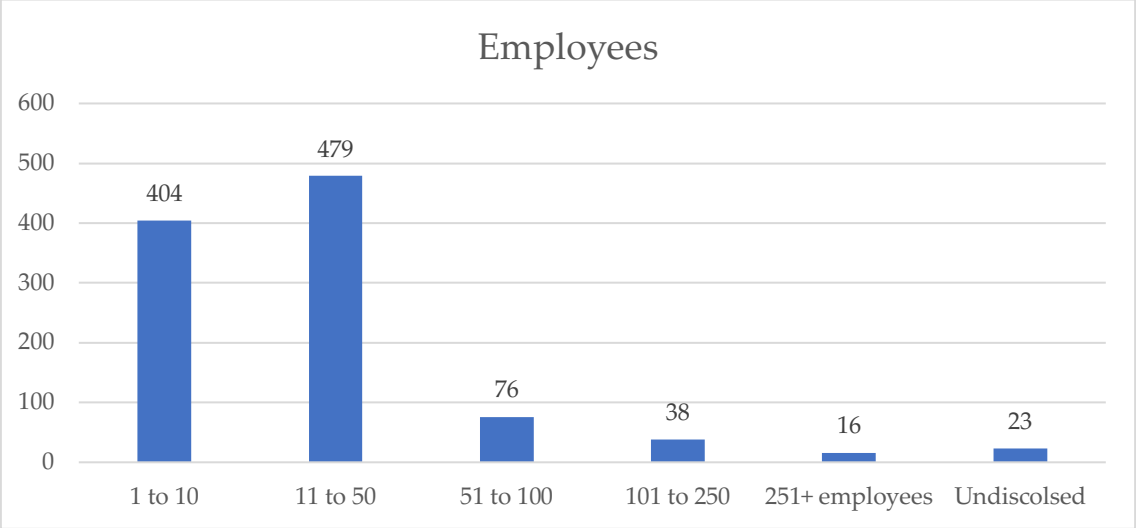

Chart 3.4: Distribution of start-ups based on number of employees

Most of the solution providers in the database employee between 11 to 50 employees (46%), a stage in which companies have grown beyond the initial phase, started to structure some processes, roles and even functions but they are not yet large-scale corporations. In the scale-up phase, that involves companies with a number of employees from 51 to 250, there is the 11% of the ventures. These start-ups have a much more structured organization, start having product or market divisions and in some cases also international expansion activities. The last category (2%) is the one of established start-ups, which count more than 250 employees, in many circumstances these companies are not identified anymore as start-ups. Finally, 23 companies do not disclose their number of employees.

After having explored the key statistics related to the profiling of start-ups provider of the B2c eCommerce sector, it is important to explore the state of financing in these companies and to highlight main differences in the global context.

Firstly, in the **Error! Reference source not found.** are presented the results related to the typology of last funding. Start-ups exchange share of their equity to receive cash need to release MVP and new products or services, enter new markets, hire staff, invest in R&D, marketing & advertising and conduct operations, until the company is profitable. The first funding type is pre-seed (26%), in this category the investments come from individual investors, family & friends and micro venture capital, that provide small quantity of money to start realizing a minimum viable product (MVP) related to a business idea, the average pre-seed funding amounted to $560k. Almost half of the fundings (45%) of the study are categorized as seed, in this phase companies exchange equity for good amount of cash to launch and advertise a usable product, hire full-time employees and research on the product-market fit. In the study, average seed funding is equivalent to $4.174 million. Series fundings are the step in which the business needs to grow and scale-up in the fastest possible way. For this reason, in these stages the amount of money given to start-ups by venture capital, private equity and big corporates drastically increase. Series A investments are the 10% of the fundings in the dataset, with an average ticket of $16.9 million. The most advanced series accounted only for the 2% of the fundings, of which 21 series B, 1 series C and 1 series D, with respectively an average funding of $43.1 million, $260 million and $150 million. Finally, the remaining 17% of the fundings were associated to different types of funding, such as grants, debts, crowdfunding, venture, corporate round, convertible note, initial coin offering and others.

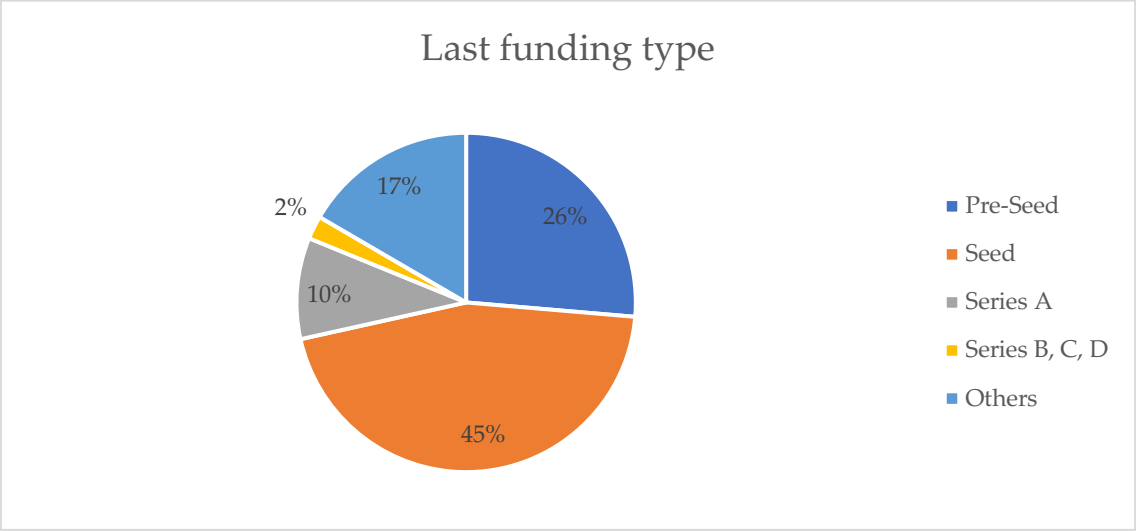

Chart 3.5: Distribution of start-ups based on last-funding type

Looking at the specific fundings amount, over the 1036 start-ups in the database, 854 provided information related to the value of their last financing. As can be seen in the Chart 3.6, there are two spikes in the distribution of fundings, in particular the

investments between $500'000 and $1 million are much lower than the two near categories. This evidence can provide an insight related to both how founders search money and how investors make deals, in fact most of the fundings in the 100-500k category are related to pre-seed rounds, instead most of the fundings in the 1M-5M category are related to seed round, signalling that to scale from seed to pre-seed founders need more than $1 million.

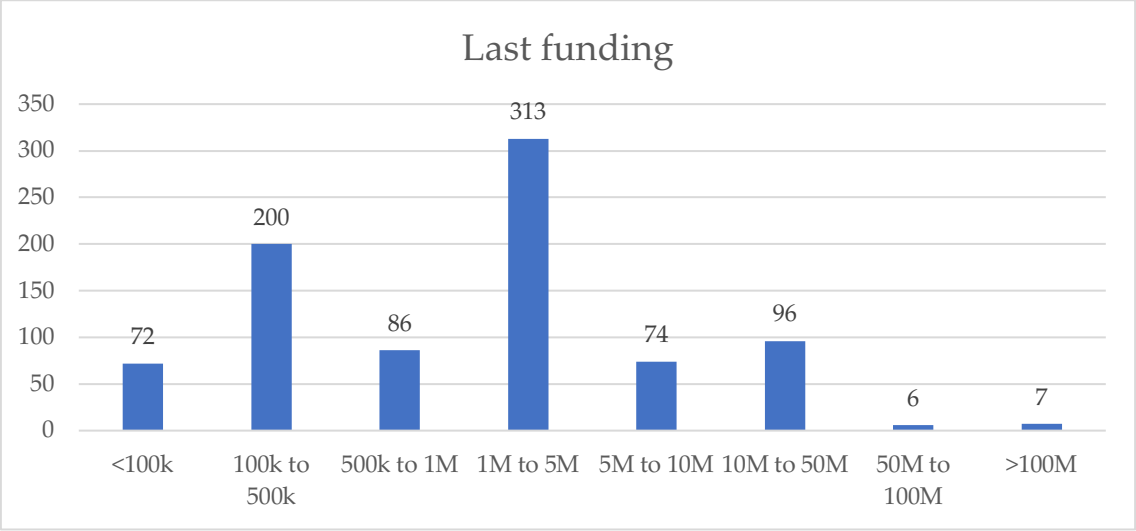

Chart 3.6: Start-ups distribution based on last funding amount (over 854 start-ups)

Looking at the total number of rounds, it can be seen that most (45%) of the analysed providers received only one funding, highlighting how these businesses are in their early stage of life. On the other hand, there is a small group of ventures (6%), that participated to more than five financing rounds, indicating that these businesses are mature and attract the interest of many investors. The complete statistics related to financing rounds are showed in the Chart 3.7.

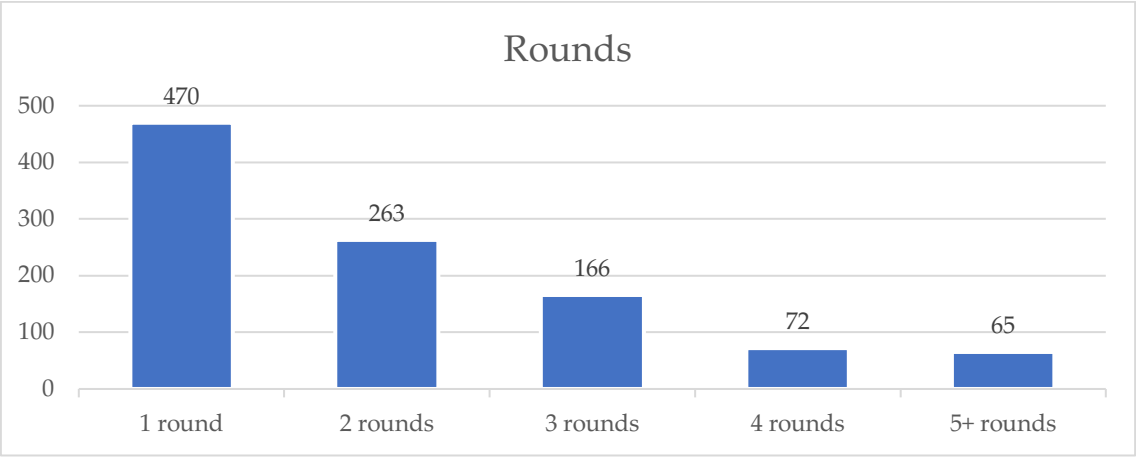

Chart 3.7: Start-ups distribution based on the number of funding rounds

As showed in the Chart 3.8, the total funding distribution is in line with the one of the last funding amount (Chart 3.6), these because in most of the cases or the last funding

is the only funding provided, or it corresponds to a new stage in the financing process, with an amount that is much higher than all the previous ones, as confirmed by the average value of funding type, previously reported.

Chart 3.8

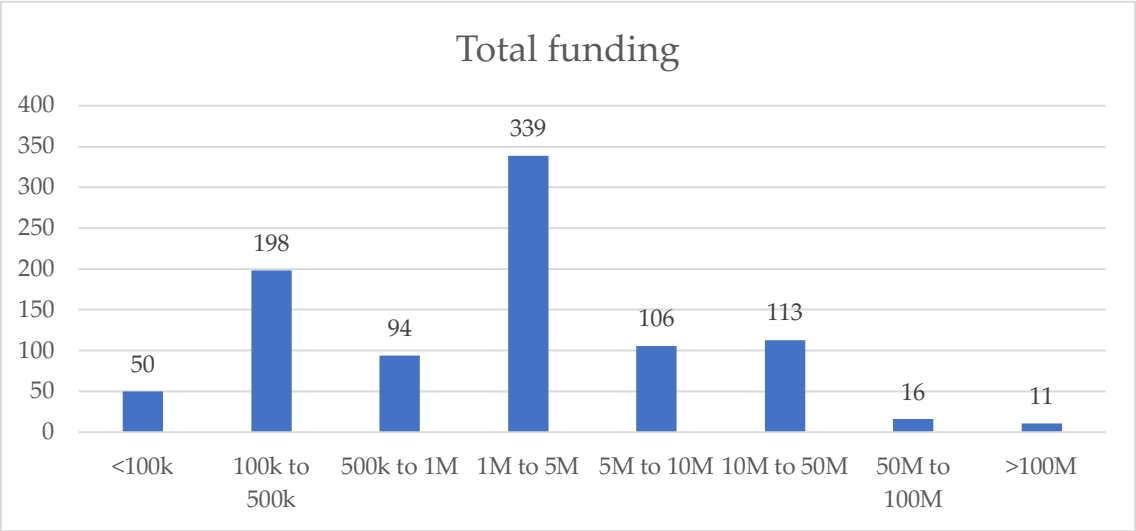

Chart 3.8: Start-ups distribution based on total funding amount (over 927 start-ups)

In the Chart 3.9 is presented the pareto analysis of total fundings provided to start-ups. As can be seen, the distribution of the investments is more than pareto optimal, in fact the first 20% of start-ups by total fundings, corresponds to 86% of the global investments in the sector. This analysis highlights the high level of concentration of investments in the sector, and so the fact that few companies receive most of the attention from investors, creating a difficult environment for competition. Start-ups that have difficulties in receiving their first funding, risk to lose signalling effect to external investors and don't attract other investments, regardless of the potential of the business model.

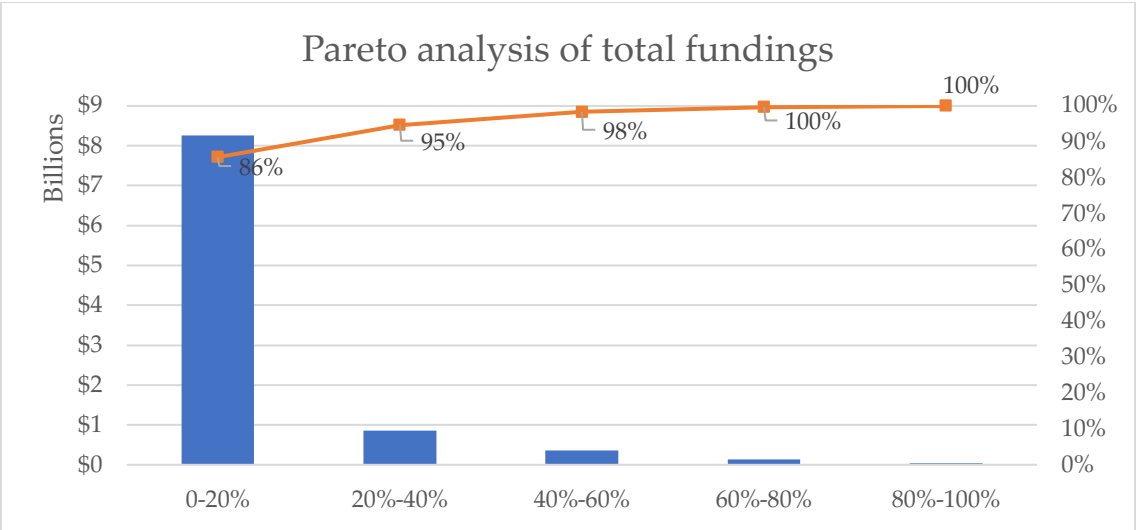

Chart 3.9: Pareto analysis of start-ups distribution by total fundings (over 927 start-ups)

As reported in the Chart 3.10, the regional amount of fundings provided to start-ups can be divided in two main groups. In Asia, Europe and North America, start-ups attract almost the totality of the investments, receiving in total $9.288 billion. The average sum of money received by start-ups in the regions are respectively $10.9 million in Asia, $12.26 million in Europe and $10.88 million in North America. Looking at the other three regions, the total sum of fundings correspond to $351.2 million, with an average amount of money received per start-up of only $3.49 million for African ventures, $5.19 million for the ones in Oceania and $2.59 million in South America.

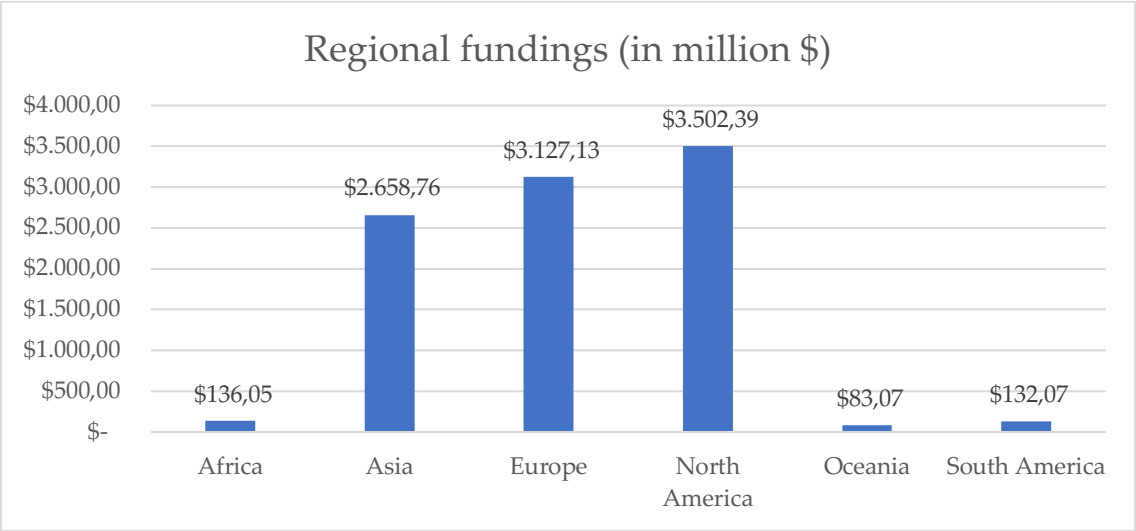

Chart 3.10: Distribution of total start-ups fundings by continent (over 927 start-ups)

Looking at total fundings related to single countries in the **Error! Reference source not found.**, the ranking of the 20 most financed countries presents some common elements and some differences with the **Error! Reference source not found.**, about most represented countries. Spain, Brazil, Nigeria, Turkey and Egypt exited the ranking, in favour of Belgium, Qatar, Hong Kong, South Korea and Argentina. USA remained the uncontested leader, with more than $3 billions in total fundings. One of the most evident changes is the climbing of Sweden (+9 positions), Mexico (+8 positions), Canada (+7 positions) and China (+5 positions). Another attention point is related to Germany, the country in fact reports an incredible $1.6 billion, 52% of USA total fundings with 13% of the start-ups. This result is the consequence of the food delivery platform and service provider Gorillas, that counted for more than 83% of the total funding.

Rank	Nation	Total Fundings	Rank	Nation	Total Fundings
1	USA	$ 3'089'670'279	11	Canada	$ 215'753'958
2	Germany	$ 1'605'278'585	12	Mexico	$ 196'370'197
3	Singapore	$ 816'762'180	13	UAE	$ 172'362'044
4	Saudi Arabia	$ 446'769'987	14	France	$ 164'895'790
5	Sweden	$ 391'886'661	15	Netherlands	$ 142'467'812
6	UK	$ 372'702'906	16	Qatar	$ 85'141'445
7	India	$ 333'083'038	17	Australia	$ 83'074'886
8	China	$ 285'002'372	18	Hong Kong	$ 73'400'000
9	Israel	$ 258'518'000	19	South Korea	$ 68'183'235
10	Belgium	$ 248'243'929	20	Argentina	$ 57'890'000

Table 3.2: Top 20 countries by total fundings

For what concerns the sectors served, start-ups can enable e-tailers in different industries to quickly adopt new technologies and increase their efficiency and effectiveness through outsourced services and improved internal processes.

Most of the start-ups provides advanced solutions, enabled by the combination of the different emerging technologies seen in the section 1.4.2, that can be applied in multiple sectors, by simply changing some of the solution's features or through the definition of specific use cases for each client. In this case the start-ups are classified as "*cross-industry*" and they compose the 49.9% of the analysed ventures.

On the opposite side, some providers focus their offering in solving a problem specific of an industry and try to become the reference point for all the e-tailers of that sector. In the analysis are identified 162 start-ups that provide industry specific solutions, and their distribution can be seen in the Chart 3.11. Fashion & accessories and grocery & food identified as the sectors with most of the unique providers, this can be due to many different factors.

For what regard the fashion industry, for example, many of these companies (14) are focused on specific marketing activations, such as 3D rendering, augmented and virtual reality that enable customers to virtually try products based on a digital avatar with their aspects and characteristics, or displaying products on their skin with smartphones cameras. Another example of industry specific start-ups is the second-

hand and product returns authentication systems (10), that can be possible using AI and image recognition capabilities or NFTs technologies in the luxury sector. Also, different start-ups (14) provide personalized recommendation systems that are specific for the fashion industry, in which not only customer taste plays an important role, but also the ability to create outfit suggestions and identify fashion trends.

In the grocery and food sector many start-ups are developing solutions for e-restaurants and meal delivery, to effectively manage orders with an omnichannel strategic view. The innovations enable restaurants to easily create digital menus that can be updated with promotions, special dishes, and other features, and to connect the kitchen with live orders coming from waiters, digital kiosks and customers applications, but also with third-party delivery platforms, to maximize the efficiency of the start-ups. Another example specific for restaurants are start-ups that enables restaurants to create multiple digital brands and manage them under the form of cloud kitchen, increasing the revenues and diversifying the offering.

In the travel and tourism sector providers (4) are developing advanced booking systems with predictive capabilities and loyalty features, to help actors in the travel sector acquire and retain more customers. Other start-ups (4) are concentrating their efforts in the creation of interactive virtual travel experiences, that can be used both as a marketing tool in the pre-purchase phase, that a service provided to customers during their visit to enrich their experience.

The remaining 357 start-ups are referred to at least two industries, but are not cross-sectorial. The high level of this result is mainly due to operation and logistics focused start-ups, that are specific for the product industry, thus not serving the travel and tourism sector.

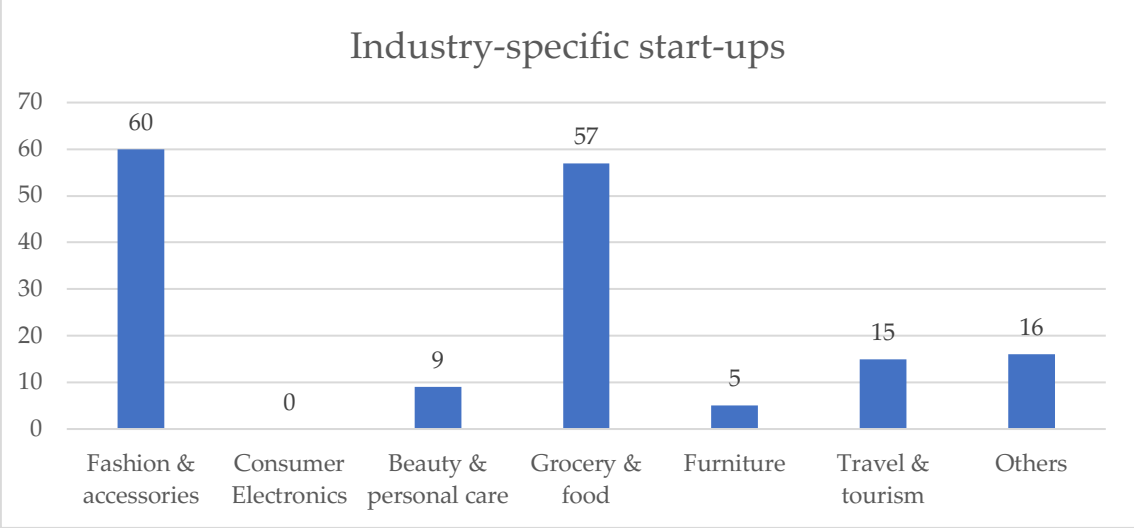

Chart 3.11: Distribution of industry-specific start-ups (over 162 start-ups)

As described in the section 2.2.3.8, retailers are adopting multiple channels in their distribution strategy, trying to maximize the sales and increase customer satisfaction

with omnichannel integrations. For this reason, in recent years, many new ventures are providing innovative solutions that can be implemented and integrated in multiple channels. In the Chart 3.12 is illustrated the relevance of the different channels for recently founded providers of the B2c eCommerce industry. The first consideration is that most of the solutions (81%) can be introduced by retailers in their website channel, this result is in line with expectations, because websites were the first online channel used to serve consumers. The second most served channel is mobile, with 48% of the start-ups optimizing solutions for use in applications. These underline how entrepreneur understand that the mobile commerce will be more and more dominant in future years and so many retailers will require improvements in their mobile applications with new features and services to be competitive on the market. Social media is the third channel by start-ups interest (38%). In Asia 43% of the start-up focus on this channel. Innovative services are provided with the aim to help retailers manage in an optimal way their advertising spending and their marketing campaigns through social, but also to enable the direct selling and the creation of loyal communities on these new platforms. Marketplaces are considered by 36% of businesses, which enable the automated listing of e-tailers catalogues on third-party marketplaces, provide tools for search engine optimization (SEO) and the monitoring of competitors offering. In particular, 56% of South American star-ups provide solutions that can be used in marketplace strategies, highlighting the importance of these platforms in the continent. Few start-ups (6%) are starting to include in their offer services optimized for metaverse platforms, that in the transition from web2 to web3 can become the future standard for electronic commerce, start-ups are including optimization for decentralized infrastructures and VR/AR applications, Asian and European ventures have the highest interest on this channel with respectively 9% and 8% of start-ups designing innovations for the channels. Finally, 31% of these providers make solutions that can be used by retailers both in physical and online channels with an integrated view.

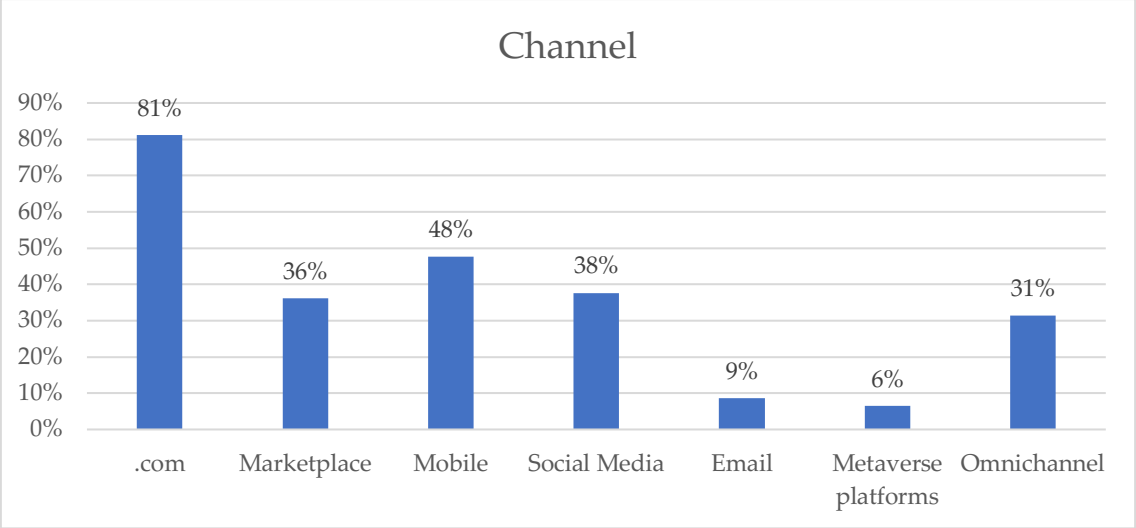

Chart 3.12: Distribution of start-ups based on channel served

To understand future directions of the eCommerce industry, it is useful to analyse which steps of the value-chain are more impacted by the innovations coming from new ventures.

As reported in the section 2.2.3.10, can be identified five steps of the B2c eCommerce value-chain. Retailers are continuously searching for new opportunities to add value to these steps and service provider start-ups are one of the most important sources of innovative solutions. Of the 1036 analysed start-ups, 64 (6%) are classified as e*nd-to-end* service providers, they enable retailers to outsource entire processes of the business and provide at least one solution in each of the five steps of the value-chain. Of the 64 businesses, 61 provided data related to their total fundings, with an average amount equal to $6.3 million. For what regard the geographical distribution of these start-ups, as can showed in the Chart 3.13, none of them is headquartered in Oceania, and their distribution is pretty similar to the general one seen in the Chart 3.3, with an increase (+4%) in the share of South America.

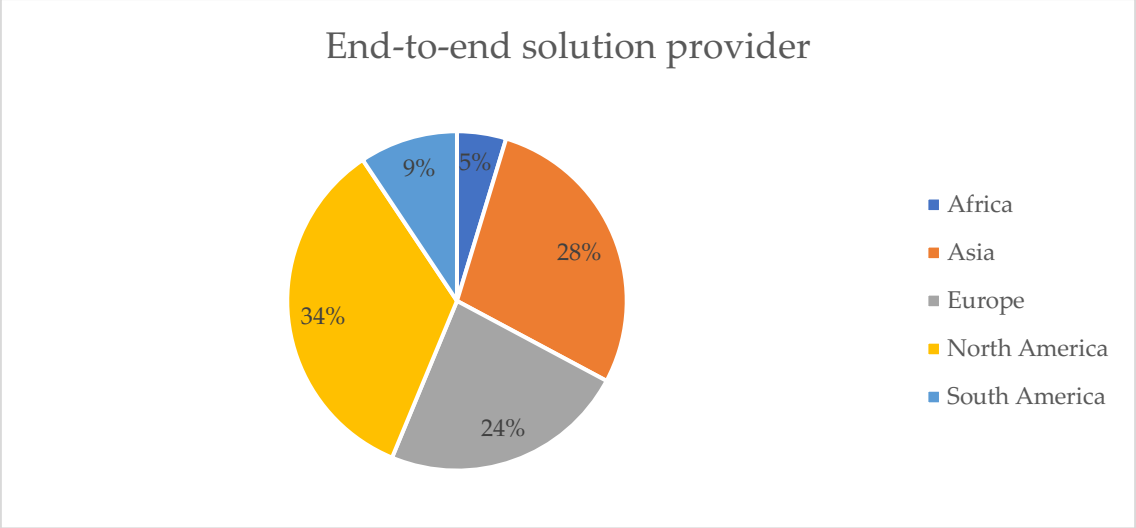

Chart 3.13: Distribution of end-to-end solution providers by continent

For what concerns the other 972 start-ups they can focus their innovations to affect a single of the five steps or on multiple steps, their distribution is presented in the Chart 3.14. The data show that most of the start-ups focus their efforts in creating innovative solutions for marketing (44%). As the second and third most crowded steps for innovation are customer care (33%) and operations & logistics (30%). Finally, with similar levels, there are platforms and payments innovations, respectively with 18% and 17% of the start-ups.

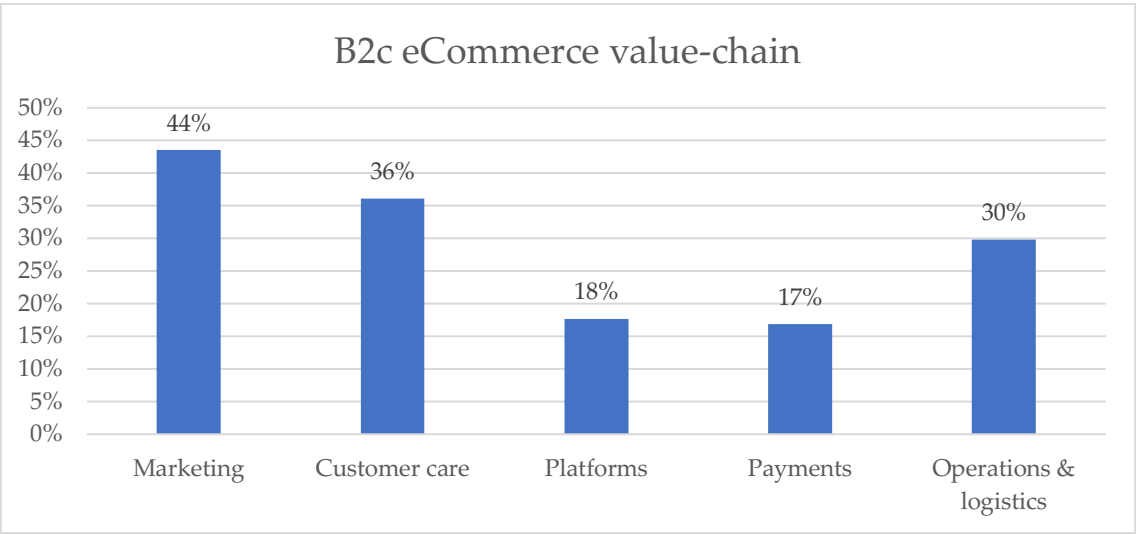

Chart 3.14: Distribution of start-ups based on affected value-chain steps (over 972 start-ups)

Of the just mentioned start-ups, 634 work to develop specific innovative solutions that impact a single step of the value-chain. As reported in the Chart 3.15, looking only at step-specific start-ups the data represent a different situation and an interesting insight. Operation & logistics focused start-ups are the most numerous, in addition, the total fundings provided to these companies is much higher than the in the other categories, with a total of $2.8 billion invested in it (over 173 provided fundings). These

can be caused by the high level of investments in specific competences and infrastructures. Marketing is the second most attractive category in terms of number of start-ups, but in terms of average investments is one of less attractive in the group, totalling $0.69 billion, with an average investment of only $4.5 million (over 153 provided fundings). Customer care ranks third for number of start-ups, in financial terms it receives a total of $0.59 billion, with an average of $5.93 million (over 99 fundings provided). Payment-focused service providers, that often are strictly related with the financial service sectors, despite being the fourth category for number of companies, are the second in terms of total fundings, with an average funding per start-up of $17.31 million (over 92 provided fundings). The least attractive category in both number of start-ups and investors' attention is platform, with only 52 companies, with an average funding of $4.34 million (over 46 fundings provided).

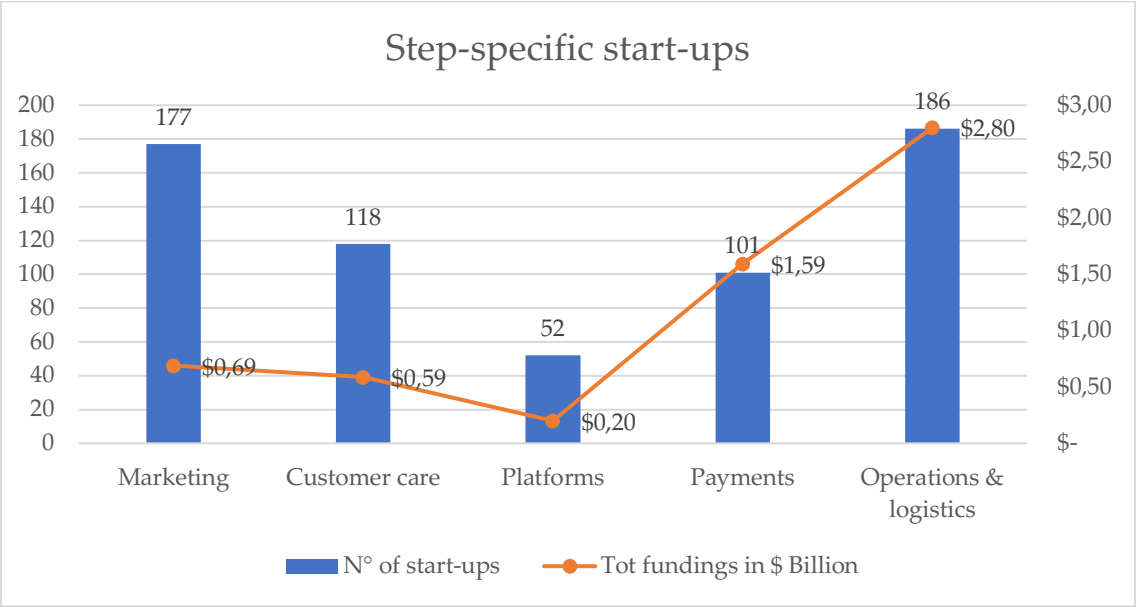

Chart 3.15: Distribution of step-specific start-ups and total fundings (over 634 start-ups)

The remaining 338 start-ups provides multiple solutions, that impact from two to four steps of the value-chain, with total fundings amounting to $3.39 billion, corresponding to an average funding of $11.18 million (over 303 provided fundings).

In the **Error! Reference source not found.** is reported the distribution of start-ups by the step of the value-chain they tackle and by the continent of origin. The chromatic scale is referred to the different steps of the value-chain, to highlight the differences of interest in the innovation field between the regions.

	Marketing	Customer care	Platforms	Payments	Operations & logistics	End-to-end
Africa	23%	20%	32%	20%	32%	7%
Asia	43%	21%	19%	31%	29%	6%
Europe	41%	13%	15%	37%	29%	5%
North America	45%	15%	12%	37%	26%	6%
Oceania	33%	11%	28%	22%	22%	0%
South America	19%	25%	15%	25%	30%	11%

Table 3.3: Distribution of start-ups by value-chain step and by continent

Finally, the long list with the 40 identified innovations topics by value-chain group is provided in the **Error! Reference source not found.**. As can be seen, in the marketing category the most active segment is the one of *Customer analytics & segmentation,* which includes innovative solutions that use artificial intelligence to enrich data and create different clusters of customers, providing automated insights about customer preferences and correlations between products and services, useful for marketers. Last development in the field includes NLP capabilities to query systems, that now can be explored using natural language and statistics and reports can be AI-generated. The start-up that received the highest fundings ($89.2 million) in the category is Threecolts, a UK-based software provider, that enables businesses to manage and automate different aspects of their eCommerce marketing strategy. In particular: Advanced segmentation and customer analytics system, sales visualization & forecasting, competitor & price monitoring, real-time listing and inventory alerts. Also, *influencer marketing platforms* are deriving a lot of interest in new ventures, with 69 start-ups identified in the database. These types of companies are strictly related to the country in which they operate, because they must be recognized by both influencers of the country and e-tailers that want to advertise that nation. In the customer care section, *personalized recommendations* and *loyalty program & community* categories are the most addressed by start-ups, with 100 and 96 businesses respectively. In the category *chatbot and automated customer assistance* are receiving increasing interests by both entrepreneurs and investors, in fact the solution can radically change how brands interact with customers, with a great reduction of customer assistance costs and an increase in customer satisfaction and conversion rate. In the platform section conversational commerce systems are the most interesting development. They aim to integrate social media, SMS and video-call to eCommerce back-end systems with an omnichannel strategy. A good example can be the Indian start-up GoKwik, that received total funding for $55.5 million to develop a complete infrastructure for retailers to create and manage an eCommerce inside social networks like WhatsApp, with the use of simple API calls. For what regards live-shopping, the Swiss venture Vinivia ($14.1 million), created a livestreaming platform for brands and creators, offering advanced feature like augmented reality interactions and advertising, shopping system directly integrated in the live, AI monitoring systems of customers

interactions and live sentiment analysis of the audience. In the payments section most of the providers offers integrated systems that enable e-tailers to provide multiple *digital payments* options to their customers, with additional features like one-click buy, payment information autocompletion, anti-fraud detection and payment failure recovery, direct bank payment, QR code payment, biometric payments and NFC payment systems. *Buy-now-pay-later* (BNPL) providers are gaining increasing attention, counting for 34 players in the dataset for a total invested amount of $1.46 billion. This result is incredibly high, the main reason is related to the business model of these start-ups, described in the section 2.2.3.10, that requires high availability of cash. The first three providers of this category are Atome (Singapore), Tamara (Saudi Arabia) and Nelo (Mexico), all of them received the last funding in the form of debt financing, for a total of $350 million. This highlights the financial market's recognition of the essential capital requirements of BNPL businesses and their capability to leverage external funding for scaling and market expansion. In the operations and logistics category, start-ups often provide a multitude of different innovations all along the processes. Solutions related to *inventory management* and *real-time order tracking* are the most developed in the category, with 75 start-ups for each of them. In the warehouse management category different businesses are focusing on developing smart robots to optimize the different operations inside depots and trucks. The first two companies by total fundings in the warehouse management category are Ambi robotics (USA) and Syrius robotics (China), with a total combined investment of $117.5 million. Both develop robotic solutions that exploit IoT, cloud computing, 5G and AI to automate warehouses, enhancing operators' efficiency.

Innovation topic	N° of start-ups	Innovation topic	N° of start-ups	Innovation topic	N° of start-ups
Marketing		**Customer care**		**Operations & logistics**	
Customer analytics & segmentation	115	Personalized recommendations	100	Inventory management	75
Marketing content creation	84	Loyalty program & community	96	Real-time order tracking	75
Demand and sales forecasting	70	Immersive services	84	Booking & order management	68
Influencer marketing platform	69	Automated & chatbot customer assistance	83	Fulfilment service	67
3D rendering	62	Customer reviews and sentiment analysis	58	Quick delivery	62
Advertising management	56	Customer survey	21	Return & re-sell	44
Price optimization & automated listing	51	**Payments**		Warehouse management	41
Digital asset management	41	Digital payment systems	106	Route optimization	34
Competitor monitoring	35	Buy-now-pay-later	34	Cross-border logistic	27
Content management platform	32	Crypto-payments	15	Multi-carrier management	22
SEO software	25	Product & delivery assurance	13	Traceability tools	21
Platforms		International payments	9	Packaging service	19
Conversational commerce	78			Click-and-collect	12
UX/UI design	60			Autonomous delivery	12
Live-shopping platform	44			Authentication platform	11

Table 3.4: List of innovation topics and related number of start-ups by value-chain category (over 972 start-ups)

4 Conclusions and future developments

4.1. Conclusions

The purpose of this research is to provide, firstly a qualitative assessment over the innovation trends that will shape the future of the B2c eCommerce sector and, secondly to understand and gain quantitative insights over the current entrepreneurial environment of start-up businesses that are service or technology providers of B2c eCommerce players.

In the introduction a comprehensive overview on the eCommerce industry is provided, with the definition of electronic commerce and the understanding of the motivating factors behind its adoption by both merchants and customer. Then, the research presents the main configurations that eCommerce systems can take on, the main actors involved and the relationships between them. To have a deep understanding over the B2c eCommerce industry, different global and regional quantitative insights are reported, highlighting the complexity and future potential of the sector. Finally, the analysis proposes an overview of the emerging technological clusters that are disrupting entire industries and every-day life of customers.

Moving on, an in-depth quantitative review of the scientific literature was conducted, in order to understand what are the business and technological innovations, that academic research is taking in consideration in the context of eCommerce sector, start-up environment and retail in general. The analysis provided different considerations concerning many aspects of the eCommerce industry. The innovative environment is explored observing differences between small & medium enterprises and large corporations, channel usage and integration and the impact of economic events, in particular the spreading of Covid-19 pandemics. Academics described and related both technological and service innovations to performance improvements and the related impact on the different customer experience stages. Finally, all the innovative solutions recognized by the literature are categorized through the definition of a structured framework, based on the identified steps of the B2c eCommerce value-chain.

The above-mentioned literature investigation revealed the existence of three interrelated elements that will determine the future evolution of the B2c eCommerce value-chain, namely technology, service providers and start-ups. This consideration, combined with the absence of specific quantitative studies for start-up service providers of the B2c eCommerce, led to the second part of the study.

A comprehensive analysis of 1036 service provider start-ups, from all around the world, was carried out, using a structured classification framework, with the main

topics identified in the previous part of the study. The research first showed that most of the start-ups are founded by couples of entrepreneurs, despite other studies showed that solo-founders and big teams usually performs better both in terms of longevity and total revenues.

From a geographical perspective new service providers are not equally distributed, with a higher concentration in North America, Europe and Asia. The USA are the absolute leader in terms of entrepreneurial activities, with 329 new ventures created in the country and more than 32% of the global investments in the sector flowing to it.

At the same time, it emerged that not all the start-ups are the same, with a very different distribution of investments between the considered companies. The pareto analysis of investments showed that the first 20% most financed companies received a total funding amount equivalent to 86% of the global fundings.

These results are further confirmed by the type of funding provided, in fact 45% of start-ups received a single funding round and 71% of the fundings provided were in the form of pre-seed or seed rounds, highlighting that most of the new ventures have just born and investors risk limited amount of money, because the high probability of failure that characterize these growth phases.

Furthermore, new service providers offer different solutions to many sectors, in fact only 162 start-ups are industry specific, serving client belonging to a single sector. The remaining 84% of companies serves multiple industries, with one-fit all solutions, or developing specific use cases for each of them.

From a channel perspective, data show that .com websites are the most watched out by new ventures, but applications and social media channels also receives many attentions. Indeed, metaverse platform channel is at an early stage of development.

Finally, the analysis reported 40 different innovations topics that impact the five stages of the B2c eCommerce value chain, with most of them focusing on the area of marketing, customer care and operations & logistics. Also, it is important to signal that 6% of the start-ups provides end-to-end services, that impact all the steps of the value-chain. Investments in the operations & logistic area are the highest in the sector, with a total of $2.8 billion allocated to innovations specific for the category.

Overall, this research has analysed a wide range of data and gathered useful information for both managerial as well as scientific aspects of the B2c eCommerce industry. It can be used as an important tool to conduct deeper analysis on the sector innovations and track in a structured way new developments. Also it provides to merchants executives and industry investors, a comprehensive overview of the ventures that will play a fundamental role in the definition of future developments of the industry and the potential impact of their innovative solutions.

4.2. Limitations and future research

Following the discussion of the empirical findings, the main constraints related to the methodology used to define the framework and to perform the analysis must be considered. In addition, it is useful to present prospective areas for future study to expand and enrich the work done.

The first limitation is related to the subjectivity in the definitions of start-up and innovation. In the study were considered as start-ups businesses, that were founded in the last five years and that received at least one funding in the last two years, therefore, the definition of other parameters could lead to different results. The level of innovation of a start-up and the related classification was determined through the research of information provided by companies in their websites or social channels, so information about solutions and innovative level can be inaccurate, limited or misleading.

The second limitation regard the data collection, in fact to conduct the research, the list of start-ups was retrieved through the Crunchbase database, that can present differences in data quality and availability between USA and European countries with rest of the world. Also, the filters and the tags associated to companies can lead to results not representative of the real situation.

In the end the framework classification can lead to different results based on how innovations are grouped, in fact many start-ups provide many solutions that can be used in different ways, impacting different steps of the value-chain and online channels.

After having considered limitations, several concepts introduced in the research can be expanded for future studies.

Looking at the literature review, a keyword analysis can be developed considering papers that focus on start-ups, service providers and B2c eCommerce, increasing the set of analysed papers. Other future research can update and upgrade the dimension of analysis of the present work, with possible different insights.

Also, correlations between the different categories of the framework can be analysed using statistical software, to uncover possible investment patterns or identify recurring factors of start-ups.

Finally, the scope of the study can be extended to service provider of B2B eCommerce, understanding the innovative trends of the sector and conducting a comparison analysis between the two industries, to understand common points and differences, that can enable new entrepreneurs to be more competitive and investors to improve the selection quality of their investments.

Bibliography

[1] CNN Business, "Inflation rises at fastest pace in 40 years, pushed up by record gas prices," [Online]. Available: https://edition.cnn.com/2022/06/10/economy/may-inflation-gas-prices/index.html. [Accessed 27 07 2023].

[2] H. Beyari, "RECENT ECOMMERCE TRENDS AND LEARNINGS FOR ECOMMERCE SYSTEM DEVELOPMENT FROM A QUALITY PERSPECTIVE," *International Journal for Quality Research,* vol. vol. 15, no. 3, pp. 797-810, 2021.

[3] R. &. K. Š. &. B. R. Fedorko, "Artificial Intelligence in ECommerce: A Literature Review," *Congress on Intelligent Systems, Proceedings of CIS 2021,* vol. 2, pp. 677-689, 2022.

[4] E. H. A. G. D. B. (. Heider Al Mashalah, "The impact of digital transformation on supply chains through eCommerce: Literature review and a conceptual framework," *Transportation Research Part E: Logistics and Transportation Review,* vol. 165, p. 102837, 2022.

[5] R. N. a. P. A. Putra, "Critical Factors in Indonesia's ECommerce Collaboration," *Journal of Theoretical and Applied Electronic Commerce Research,* vol. 16, no. 6, p. 2458–2469, 2021.

[6] R. C. MacGregor and L. Vrazalic, "A basic model of electronic commerce adoption barriers: A study of regional small businesses in Sweden and Australia," *Journal of small business and enterprise development,* vol. 12, no. 4, pp. 510-527, 2005.

[7] A. R. T. Putri, Y. Priyandari and E. Liquiddanu, "Design of ECommerce Competency Improvement Program for Batik SMEs in Surakarta," *IOP conference series. Materials Science and Engineering,* vol. 598, no. 1, p. 12067, 2019.

[8] S. Kim, "The diffusion of the Internet: Trend and causes," *Social Science Research,* vol. 40, no. 2, pp. 602-613, 2011.

[9] L. &. C. D. &. D. M. &. S. T. Andrés, "Diffusion of the Internet: A Cross-Country Analysis," *Telecommunications Policy,* vol. 34, pp. 323-340, 2007.

[10] S. L. T. M. C. R.-C. Rogelio Granguillhome Ochoa, "Mobile internet adoption in West Africa," *Technology in Society*, vol. 68, p. 101845, 2022.

[11] A. G. M. N. M. F. J. P. F. L. M. a. S. P. R. M. Bădîrcea, "ECommerce and the Factors Affecting Its Development in the Age of Digital Technology: Empirical Evidence at EU–27 Level," *Sustainability*, vol. 14, no. 1, p. 101, 2021.

[12] eMarketer, "Global Ecommerce Forecast," 2022. [Online]. Available: https://on.emarketer.com/rs/867-SLG-901/images/eMarketer%20Global%20Ecommerce%20Forecast%20Report.pdf. [Accessed 27 August 2023].

[13] J. S. a. N. Luo, "Research on Innovative Development of Crossborder eCommerce under the Background of Wireless Communication and Internet of Things," *Wireless Communications & Mobile Computing (Online)*, vol. 2022, no. https://www.proquest.com/scholarly-journals/research-on-innovative-development-crossborder-e/docview/2683803480/se-2, 2022.

[14] OECD, "Electronic Commerce - IDC Definitions & Methodologies," 1999. [Online]. Available: https://www.oecd.org/digital/ieconomy/1893649.pdf. [Accessed 27 August 2023].

[15] C. L. L. R. a. V. P. A. Faccia, "Innovation and ECommerce Models, the Technology Catalysts for Sustainable Development: The Emirate of Dubai Case Study," *Sustainability*, vol. 15, no. 4, p. 3419, 2023.

[16] Bloomberg, "Inflation Is Helping Drive a Boom in Secondhand Shopping," 5 April 2023. [Online]. Available: https://www.bloomberg.com/news/articles/2023-04-05/inflation-is-helping-drive-a-boom-in-secondhand-shopping#xj4y7vzkg. [Accessed 27 August 2023].

[17] eBay, "eBay: Our Company," [Online]. Available: https://www.ebayinc.com/company/. [Accessed 27 August 2023].

[18] T. C. D. S. Dennis Z. Yu, "Impact of supply chain power and drop-shipping on a manufacturer's optimal distribution channel strategy," *European Journal of Operational Research*, vol. 259, no. 2, pp. 554-563, 2017.

[19] L. Tian, A. J. Vakharia, Y. (. Tan and Y. Xu, "Marketplace, Reseller, or Hybrid: Strategic Analysis of an Emerging E-Commerce Model," *Production and operations management*, vol. 27, no. 8, pp. 1595-1610, 2018.

[20] G. Z. H. &. L. M. Li, "Reselling or drop shipping: Strategic analysis of ECommerce dual-channel structures.," *Electronic Commerce Research* , vol. 20, p. 475–508, 2020.

[21] The World Bank, "Population by country, total," 2022. [Online]. Available: https://data.worldbank.org/indicator/SP.POP.TOTL?locations=CN. [Accessed 27 August 2023].

[22] Forbes, "Steering Through Inflation: Strategies For ECommerce Resilience And Growth," june 6 2023. [Online]. Available: https://www.forbes.com/sites/shoplazza/2023/06/06/steering-through-inflation-strategies-for-eCommerce-resilience-and-growth/. [Accessed 27 August 2023].

[23] Statista, "ECommerce worldwide," 2023. [Online]. Available: https://www.statista.com/study/10653/eCommerce-worldwide-statista-dossier/. [Accessed 27 August 2023].

[24] eMarketer, "China Ecommerce Forecast 2023," 14 July 2023. [Online]. Available: https://www.insiderintelligence.com/content/china-ecommerce-forecast-2023. [Accessed 27 August 2023].

[25] Forbes, "China's Economy Is Still Stuck," 7 August 2023. [Online]. Available: https://www.forbes.com/sites/miltonezrati/2023/08/07/chinas-economy-is-still-stuck/. [Accessed 27 August 2023].

[26] eMarketer, "US Ecommerce Forecast 2023," 28 July 2023. [Online]. Available: https://www.insiderintelligence.com/content/us-ecommerce-forecast-2023. [Accessed 27 August 2023].

[27] Committee for a responsible federal budget, "2022 Inflation Hit a 41 Year Record," 6 March 2023. [Online]. Available: https://www.crfb.org/blogs/2022-inflation-hit-41-year-record#:~:text=Specifically%2C%20CPI%20inflation%20totaled%207.1,levels%20in%20over%2040%20years.. [Accessed 27 August 2023].

[28] NTT DATA UK&I, "Consumers are returning to the high street and demand for blended omnichannel experience emerges," 9 February 2023. [Online]. Available: https://uk.nttdata.com/news/consumers-are-returning-to-the-high-street-and-demand-for-blended-omnichannel-experience-emerges. [Accessed 27 August 2023].

[29] Statista, "eCommerce report 2023," 2023. [Online]. Available: https://www.statista.com/study/42335/ecommerce-report/. [Accessed 27 August 2023].

[30] Amazon, "Amazon annual report 2022," 2023. [Online]. Available: https://ir.aboutamazon.com/annual-reports-proxies-and-shareholder-letters/default.aspx. [Accessed 27 August 2023].

[31] Statista, "Online sales of Walmart worldwide from fiscal year 2019 to 2023, by division," 20 March 2023. [Online]. Available: https://www.statista.com/statistics/1109330/walmart-ecommerce-sales-by-division-worldwide/. [Accessed 27 August 2023].

[32] Apple, "Apple form 10-K 2022," 27 October 2022. [Online]. Available: https://investor.apple.com/investor-relations/default.aspx. [Accessed 27 August 2023].

[33] McKinsey, "The State of Fashion 2023," 29 November 2022. [Online]. Available: https://www.mckinsey.com/industries/retail/our-insights/state-of-fashion#/. [Accessed 27 August 2023].

[34] McKinsey, "Thinking inside the subscription box: New research on eCommerce consumers," February 9 2018. [Online]. Available: https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/thinking-inside-the-subscription-box-new-research-on-ecommerce-consumers. [Accessed 27 August 2023].

[35] Accenture, "Social commerce marketing strategies in 2022 & beyond," 7 May 2022. [Online]. Available: https://www.accenture.com/it-it/insights/software-platforms/social-commerce-strategies-brands. [Accessed 27 August 2023].

[36] Statista, "Travel & Tourism: market data & analysis," 2023. [Online]. Available: https://www.statista.com/study/40460/travel-tourism/. [Accessed 27 August 2023].

[37] S. Melián-González, "Gig economy delivery services versus professional service companies: Consumers' perceptions of food-delivery service," *Technology in Society*, vol. 69, p. 101969, 2022.

[38] Statista, "Online Food Delivery – market data analysis & forecast," 2023. [Online]. Available: https://www.statista.com/study/40457/food-delivery/. [Accessed 27 August 2023].

[39] C. D. X. T. E. W. N. Bin Shen, "Emerging technologies in eCommerce operations and supply chain management," *Electronic Commerce Research and Applications,* vol. 55, p. 101203, 2022.

[40] W. Reinartz, N. Wiegand and M. Imschloss, "The impact of digital transformation on the retailing value chain," *International journal of research in marketing,* vol. 36, no. 3, pp. 350-366, 2019.

[41] M. Quinones, M. Gomez-Suarez, I. Cruz-Roche and A. M. Díaz-Martín, "Technology: a strategic imperative for successful retailers," *International journal of retail & distribution management,* vol. 51, no. 4, pp. 546-566, 2023.

[42] S. C. Silva, J. C. Dias and B. Braga, "How footwear companies can use online CX to WOW customers," *International journal of retail & distribution management,* vol. 51, no. 4, pp. 465-483, 2023.

[43] "The Rising Trends of Smart ECommerce Logistics," *Kalkha, Hicham ; Khiat, Azeddine ; Bahnasse, Ayoub ; Ouajji, Hassan* , vol. 11, pp. 33839-33857, 2023.

[44] J. A. Cano, A. Londoño-Pineda and C. Rodas, "Sustainable Logistics for ECommerce: A Literature Review and Bibliometric Analysis," *Sustainability,* vol. 14, no. 19, p. 12247, 2022.

[45] V. Shankar, K. Kalyanam, P. Setia, A. Golmohammadi, S. Tirunillai, T. Douglass, J. Hennessey, J. Bull and R. Waddoups, "How Technology is Changing Retail," *Journal of retailing,* vol. 97, no. 1, pp. 13-27, 2021.

[46] Stanford, "Stanford Encyclopedia of Philosophy - Artificial Intelligence," 12 July 2018. [Online]. Available: https://plato.stanford.edu/entries/artificial-intelligence/. [Accessed 27 August 2023].

[47] C. P. E. S. Haroon Sheikh, "Artificial Intelligence: Definition and Background," *Research for Policy,* vol. Mission AI, no. 2, pp. 15-41, 2023.

[48] Gartner, "What Is Artificial Intelligence?," [Online]. Available: https://www.gartner.com/en/topics/artificial-intelligence. [Accessed 27 August 2023].

[49] EY, "The CEO Outlook Pulse - July 2023," 24 July 2023. [Online]. Available: https://www.ey.com/en_gl/ceo/ceo-outlook-global-report. [Accessed 27 August 2023].

[50] Reuters, "ChatGPT sets record for fastest-growing user base - analyst note," 2 February 2023. [Online]. Available: https://www.reuters.com/technology/chatgpt-sets-record-fastest-growing-user-base-analyst-note-2023-02-01/. [Accessed 27 August 2023].

[51] P. T. E. A. M. N. C. R. G. B. N. B. P. R. Theo Lynn, "The Internet of Things: Definitions, Key Concepts, and Reference Architectures," *Palgrave Studies in Digital Business & Enabling Technologies,* Vols. The Cloud-to-Thing Continuum, 2020.

[52] J. Zhao and P. Zhang, "Investigating the role of ECommerce marketing capabilities to achieve the strategic performance of tourism firms," *Frontiers in psychology,* vol. 14, pp. 1105539-1105539, 2023.

[53] H. A. Mashalah, E. Hassini, A. Gunasekaran and D. Bhatt (Mishra), "The impact of digital transformation on supply chains through eCommerce: Literature review and a conceptual framework," *Transportation research. Part E, Logistics and transportation review,* vol. 165, p. 102837, 2022.

[54] Y. K. M. Tamara Almarabeh, "Cloud Computing of ECommerce," *Modern Applied Science,* vol. 13, no. 1, 2018.

[55] T. A. Y. Majdalawi, "Cloud Computing of ECommerce," *Modern Applied Science,* vol. 13, no. 1, pp. 27-35, 2019.

[56] D. Wang, "Influences of Cloud Computing on ECommerce Businesses and Industry," *Journal of Software Engineering and Applications,* vol. 6, pp. 313-318, 2013.

[57] A. A. A. O. A. E. A. M. O. a. O. O. J. J. A. Adebusola, "An Overview of 5G Technology," *International Conference in Mathematics, Computer Engineering and Computer Science,* pp. 1-4, 2020.

[58] McKinsey, "What is 5G?," 7 October 2022. [Online]. Available: https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-5g. [Accessed 2023 August 2023].

[59] D. Buhalis, T. Harwood, V. Bogicevic, G. Viglia, S. Beldona and C. Hofacker, "Technological disruptions in services: lessons from tourism and hospitality," *Journal of service management,* vol. 30, no. 4, pp. 484-506, 2019.

[60] P. A. Rauschnabel, R. Felix, C. Hinsch, H. Shahab and F. Alt, "What is XR? Towards a Framework for Augmented and Virtual Reality," *Computers in human behavior,* vol. 133, p. 107289, 2022.

[61] G. I. R. M. R. G. Cipresso P, "The Past, Present, and Future of Virtual and Augmented Reality Research: A Network and Cluster Analysis of the Literature," *Front Psychol,* vol. 9, p. 2086, 2018.

[62] Financial Times, "Apple's mixed reality headset is a hedge against disruption," 1 June 2023. [Online]. Available: https://www.ft.com/content/9d0aa231-40fb-4d02-8e94-79930d30c133. [Accessed 27 August 2023].

[63] B. Shen, W. Tan, J. Guo, L. Zhao and P. Qin, "How to Promote User Purchase in Metaverse? A Systematic Literature Review on Consumer Behavior Research and Virtual Commerce Application Design," *Applied sciences,* vol. 11, no. 23, p. 11087, 2021.

[64] M. Y.-C. Yim, S.-C. Chu and P. L. Sauer, "Is Augmented Reality Technology an Effective Tool for ECommerce? An Interactivity and Vividness Perspective," *Journal of interactive marketing,* vol. 39, pp. 89-103, 2017.

[65] P. Q. Brito, J. Stoyanova and A. Coelho, "Augmented reality versus conventional interface: Is there any difference in effectiveness?," *Multimedia tools and applications,* vol. 77, no. 6, pp. 7487-7516, 2018.

[66] W. D. Hoyer, M. Kroschke, B. Schmitt, K. Kraume and V. Shankar, "Transforming the Customer Experience Through New Technologies," *Journal of interactive marketing,* vol. 51, no. 1, pp. 57-71, 2020.

[67] S. Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," 24 May 2009. [Online]. Available: https://bitcoin.org/bitcoin.pdf. [Accessed 27 August 2023].

[68] C. S. Horst Treiblmaier, "The impact of blockchain on eCommerce: A framework for salient research topics," *Electronic Commerce Research and Applications,* vol. 48, p. 101054, 2021.

[69] Y. L. Fuli Zhou, "Blockchain-Enabled Cross-Border ECommerce Supply Chain Management: A Bibliometric Systematic Review," *Sustainability,* vol. 14, no. 23, p. 15918, 2022.

[70] E. K. O. &. S. K. Sung, "NFT luxury brand marketing in the metaverse: Leveraging blockchain-certified NFTs to drive consumer behavior," *Psychology & marketing,* p. 1–20, 2023.

[71] J. Kim, M. Kim, S. Im and D. Choi, "Competitiveness of E Commerce Firms through ESG Logistics," *Sustainability,* vol. 13, no. 20, p. 11548, 2021.

[72] J. O. Haryanto and F. I. Chang, "Analysis Of ECommerce Providers' Role In Solving The Issues Of Retail ECommerce Logistics In Jakarta (Study Case Of PT Acommerce Solusi Lestari)," *Jurnal manajemen,* vol. 22, no. 1, p. 14–30, 2018.

[73] M.-C. Enache, "ECommerce trends," *Analele Universității "Dunărea de Jos" Galați. Fascicula I, Economie și informatica aplicata,* vol. 24, no. 2, pp. 67-71, 2018.

[74] L. Lamey, E. Breugelmans, M. Vuegen and A. ter Braak, "Retail service innovations and their impact on retailer shareholder value: evidence from an event study," *Journal of the Academy of Marketing Science,* vol. 49, no. 4, pp. 811-833, 2021.

[75] J. Moore, "Managed services model takes evolutionary twists and turns," TechTarget, 25 September 2019. [Online]. Available: https://www.techtarget.com/searchitchannel/feature/Managed-services-model-takes-evolutionary-twists-and-turns. [Accessed 27 August 2023].

[76] Ministero delle imprese e del made in italy, "Startup innovative," [Online]. Available: https://www.mimit.gov.it/it/impresa/competitivita-e-nuove-imprese/start-up-innovative. [Accessed 27 August 2023].

[77] S. Blank, "What's A Startup? First Principles.," 25 January 2010. [Online]. Available: https://steveblank.com/2010/01/25/whats-a-startup-first-principles/. [Accessed 27 August 2023].

[78] A. Behl, P. Dutta, S. Lessmann, Y. K. Dwivedi and S. Kar, "A conceptual framework for the adoption of big data analytics by eCommerce startups: a case-based approach," *Information systems and e-business management,* vol. 17, no. 2-4, pp. 285-318, 2019.

[79] S. Krymov, M. Kolgan, S. Suvorova and O. Martynenko, "Digital technologies and transformation of modern retail," *IOP conference series. Materials Science and Engineering,* vol. 497, no. 1, p. 12126, 2019.

[80] R. M. Ferraz, C. P. da Veiga, C. R. P. da Veiga, T. S. G. Furquim and W. V. da Silva, "After-Sales Attributes in ECommerce: A Systematic Literature Review and Future Research Agenda," *Journal of theoretical and applied electronic commerce research,* vol. 18, no. 1, pp. 475-500, 2023.

[81] R. Mangiaracina, A. Perego, A. Seghezzi and A. Tumino, "Innovative solutions to increase last-mile delivery efficiency in B2C eCommerce: a literature review," *International journal of physical distribution & logistics management,* vol. 49, no. 9, pp. 901-920, 2019.

[82] S. Krishnan, "eCommerce in the Web3 Era," *Business, Management and Economics. IntechOpen,* vol. New Topics in Emerging Markets, 2022.

[83] M. S. A. a. M. L. Hänninen, "igitalization in retailing: multi-sided platforms as drivers of industry transformation," *Baltic Journal of Management,* vol. 13, no. 2, pp. 152-168, 2018.

[84] Statista, 10 August 2021. [Online]. Available: https://www.statista.com/chart/13139/estimated-worldwide-mobile-eCommerce-sales/. [Accessed 27 August 2023].

[85] M. W. K. R. D. D. J. K. Andrew Park, "Interoperability: Our exciting and terrifying Web3 future," *Business Horizons,* vol. 66, no. 4, pp. 529-541, 2023.

[86] S. I.-P. a. E. Acquila-Natale, "The Future of ECommerce: Overview and Prospects of Multichannel and Omnichannel Retail," *Journal of Theoretical and Applied Electronic Commerce Research,* vol. 18, no. 1, p. 656–667, 2023.

[87] S. a. M. V. Saghiri, "Omni-channel integration: the matter of information and digital technology," *International Journal of Operations & Production Management* , vol. 41, no. 11, pp. 1660-1710, 2021.

[88] F. v. Briel, "The future of omnichannel retail: A four-stage Delphi study," *Technological Forecasting and Social Change,* vol. 132, pp. 217-229, 2018.

[89] European Parliament, "EUR-Lex," 4 May 2016. [Online]. Available: https://eur-lex.europa.eu/eli/reg/2016/679/oj. [Accessed 27 August 2023].

[90] Forbes, "Apple ITP 2.1: What It Is, What It Means, And Why It Matters," 10 April 2019. [Online]. Available: https://www.forbes.com/sites/forrester/2019/04/10/apple-itp-2-1-what-it-is-what-it-means-and-why-it-matters/. [Accessed 27 August 2023].

[91] Techcrunch, "Google delays move away from cookies in Chrome to 2024," 2 July 2022. [Online]. Available: https://techcrunch.com/2022/07/27/google-delays-move-away-from-cookies-in-chrome-to-2024/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAFTTy0nfxx7PuC6bMVXZUw13rQ3HJvxXyC_mGYIZ0IGu6-TPj55Qno8SaVd8eCSYMqxwTCJFxTD5f8pMyGuZ. [Accessed 27 August 2023].

[92] R. S. Anne L. Roggeveen, "Customer-Interfacing Retail Technologies in 2020 & Beyond: An Integrative Framework and Research Directions," *Journal of Retailing,* vol. 96, no. 3, pp. 299-309, 2020.

[93] G. P. G. C. Eleonora Pantano, "A strategic framework for technological innovations in support of the customer experience: A focus on luxury retailers," *Journal of Retailing and Consumer Services,* vol. 66, p. 102959, 2022.

[94] C. M. C. Bower Joseph L., "Disruptive technologies: catching the wave," *Harvard Business Review,* pp. 43-53, 1995.

[95] B. Asdecker, "Building the ECommerce Supply Chain of the Future: What Influences Consumer Acceptance of Alternative Places of Delivery on the Last-Mile," *Logistics,* vol. 5, no. 4, p. 90, 2021.

[96] O. N. &. G. S. Mishra, "Antecedents and Impact of ECommerce Adoption among New Venture Firms: Evidence from Tourism and Hospitality Industry," *Vision,* vol. 24, no. 4, p. 431–440, 2020.

[97] A. A. Jahanshahi, S. X. Zhang and A. Brem, "ECommerce for SMEs: empirical insights from three countries," *Journal of small business and enterprise development,* vol. 20, no. 4, pp. 849-865, 2013.

[98] D. Pickernell, P. Jones, G. Packham, B. Thomas, G. White and R. Willis, "ECommerce trading activity and the SME sector: an FSB perspective," *Journal of small business and enterprise development,* vol. 20, no. 4, pp. 866-888, 2013.

[99] Crunchbase, "About Us," Crunchbase, [Online]. Available: https://about.crunchbase.com/about-us/. [Accessed August 27 2023].

[100] G. Cassar, "The financing of business start-ups," *Journal of Business Venturing,* vol. 19, no. 2, pp. 261-283, 2004.

[101] T. Howell, C. Bingham and B. Hendricks, "Going Alone or Together? A Configurational Analysis of Solo Founding vs. Cofounding," *Organization science (Providence, R.I.),* vol. 33, no. 6, pp. 2421-2450, 2022.

[102] E. M. Jason Greenberg, "Sole Survivors: Solo Ventures Versus Founding Teams," *SSRN Electronic Journal ,* 2018.

[103] Departments of economic and social affairs, Population division, "World population prospects 2022," United Nations, 2023. [Online]. Available: https://population.un.org/wpp/. [Accessed 27 August 2023].

[104] Crunchbase, "How The Crunchbase News Team Uses Data In Its Reporting," Crunchbase, [Online]. Available: https://news.crunchbase.com/methodology/#:~:text=While%20Crunchbase%20strives%20to%20be,capital%20market%20in%20the%20world.. [Accessed 27 August 2023].

A. Appendix A

A.1 Literature review list of papers

Title	Year	Authors	Journal
The impact of digital transformation on the retailing value chain	2019	Werner Reinartz, Nico Wiegand, Monika Imschloss	International Journal of Research in Marketing
RECENT ECOMMERCE TRENDS AND LEARNINGS FOR ECOMMERCE SYSTEM DEVELOPMENT FROM A QUALITY PERSPECTIVE	2021	Beyari, Hasan	International Journal for Quality Research
ECommerce Trends	2018	Maria-Cristina ENACHE	Analele Universității "Dunărea de Jos" Galați. Fascicula I, Economie și informatica aplicata
Innovation and ECommerce Models, the Technology Catalysts for Sustainable Development: The Emirate of Dubai Case Study	2023	Alessio Faccia, Corlise Liesl Le Roux, Vishal Pandey	Sustainability
Building the ECommerce Supply Chain of the Future: What Influences Consumer Acceptance of Alternative Places of Delivery on the Last-Mile	2021	Björn Asdecker	Logistics
AI-ENABLED TECHNOLOGY INNOVATION IN ECOMMERCE	2023	Xusen Cheng, Jason Cohen, Jian Mou	Journal of Electronic Commerce Research
The Future of ECommerce: Overview and Prospects of Multichannel and Omnichannel Retail	2023	Santiago Iglesias-Pradas, Emiliano Acquila-Natale	Journal of Theoretical and Applied Electronic Commerce Research
Technology: a strategic imperative for successful retailers	2023	Myriam Quinones, Monica Gomez-Suarez, Ignacio Cruz-Roche, Ana M. Díaz-Martín	International Journal of Retail & Distribution Management
How footwear companies can use online CX to WOW customers	2023	Susana C. Silva, Joana Carmo Dias, Beatriz Braga	International Journal of Retail & Distribution Management
Competitiveness of E Commerce Firms through ESG Logistics	2021	Kim, Jinsung ; Kim, Minseok ; Im, Sehyeuk ; Choi, Donghyun	Sustainability
The future of eCommerce? Understanding livestreaming commerce continuance usage	2023	Chong, Han Xi ; Hashim, Ahmad Hariza ; Osman, Syuhaily ; Lau, Jasmine Leby ; Aw, Eugene Cheng-Xi	International journal of retail & distribution management
After-Sales Attributes in ECommerce: A Systematic Literature Review and Future Research Agenda	2023	R. M. Ferraz ; C. P. da Veiga ; C. R. P. da Veiga ; T. S. G. Furquim ; W. V. da Silva	Journal of theoretical and applied electronic commerce research

The Rising Trends of Smart ECommerce Logistics	2022	Kalkha, Hicham ; Khiat, Azeddine ; Ayoub Bahnasse ; Ouajji, Hassan	IEEE access
The Impact of digital technology on eCommerce development in Russian Federation	2020	Lobacheva, Elena ; Yadova, Natalia; Falko, S. ; Timofeeva, Yu ; Kuzmichev, A.	MATEC Web of Conferences
Sustainable Logistics for ECommerce: A Literature Review and Bibliometric Analysis	2022	Cano, Jose Alejandro ; Londoño-Pineda, Abraham ; Rodas, Carolina	Sustainability
Service innovation in eCommerce last mile delivery: Mapping the e-customer journey	2019	Vakulenko, Yulia ; Shams, Poja ; Hellström, Daniel ; Hjort, Klas	Journal of business research
Innovative solutions to increase last-mile delivery efficiency in B2C eCommerce: a literature review	2019	Mangiaracina, Riccardo ; Perego, Alessandro ; Seghezzi, Arianna ; Tumino, Angela	International journal of physical distribution & logistics management
Emerging technologies in eCommerce operations and supply chain management	2022	Shen, Bin ; Dong, Ciwei ; Tong, Bruce ; Ngai, Eric W. T	Electronic commerce research and applications
Investigating the role of ECommerce marketing capabilities to achieve the strategic performance of tourism firms	2023	Zhao, Jianchun ; Zhang, Peilin	Frontiers in psychology
The impact of digital transformation on supply chains through eCommerce: Literature review and a conceptual framework	2022	Heider Al Mashalah, Elkafi Hassini, Angappa Gunasekaran, Deepa Bhatt (Mishra)	Transportation research
Analysis Of ECommerce Providers' Role In Solving The Issues Of Retail ECommerce Logistics In Jakarta (Study Case Of PT Acommerce Solusi Lestari)	2018	Haryanto, Jony Oktavian ; Chang, Florencia Irene	Jurnal manajemen
Retail service innovations and their impact on retailer shareholder value: evidence from an event study	2021	Lamey, Lien ; Breugelmans, Els ; Vuegen, Maya ; ter Braak, Anne	Journal of the Academy of Marketing Science
The future of omnichannel retail: A four-stage Delphi study	2018	von Briel, Frederik	Technological Forecasting and Social Change
Digitalization driven retail business model innovation: Evaluation of past and avenues for future research trends	2022	Mostaghel, Rana ; Oghazi, Pejvak ; Parida, Vinit ; Sohrabpour, Vahid	Journal of business research
Digital technologies and transformation of modern retail	2019	Krymov, Sergei ; Kolgan, Maria ; Suvorova, Svetlana ; Martynenko, Oksana	IOP conference series
Technological disruptions in services: lessons from tourism and hospitality	2019	Buhalis, Dimitrios ; Harwood, Tracy ; Bogicevic, Vanja ; Viglia, Giampaolo ; Beldona, Srikanth ; Hofacker, Charles	Journal of Service Management
A strategic framework for technological innovations in support of the customer experience: A focus on luxury retailers	2022	Eleonora Pantano, Giuseppe Pedeliento, George Christodoulides	Journal of Retailing and Consumer Services
Investigating the moderating role of AI-enabled services on flow and awe experience	2022	Pradeep Kautish, Arpita Khare	International Journal of Information Management
How Technology is Changing Retail	2021	Shankar, Venkatesh ; Kalyanam, Kirthi ; Setia, Pankaj ; Golmohammadi, Alireza ; Tirunillai, Seshadri ; Douglass, Tom ; Hennessey, John ; Bull, J.S. ; Waddoups, Rand	Journal of retailing

Artificial Intelligence in ECommerce: A Literature Review	2022	Richard, Fedorko; Štefan, Kráľ; Radovan,Bačík	Congress on Intelligent Systems
Transforming the Customer Experience Through New Technologies	2020	Wayne D. Hoyer, Mirja Kroschke, Bernd Schmitt, Karsten Kraume, Venkatesh Shankar	Journal of Interactive Marketing
The role of augmented reality in redefining e-tailing: A review and research agenda	2023	Pragya Jayaswal, Biswajita Parida	Journal of Business Research
Omni-channel integration: the matter of information and digital technology	2021	Soroosh Saghiri, Vahid Mirzabeiki	International Journal of Operations & Production Management
Critical Factors in Indonesia's ECommerce Collaboration	2021	Rahmat Nurcahyo, Prawira Adi Putra	Journal of Theoretical and Applied Electronic Commerce Research
Customer-Interfacing Retail Technologies in 2020 & Beyond: An Integrative Framework and Research Directions	2020	Anne L. Roggeveen, Raj Sethuraman	Journal of Retailing
Retailing and emergent technologies	2021	Dhruv Grewal, Dinesh K. Gauri, Gopal Das, James Agarwal, Mark T. Spence	Journal of Business Research
eCommerce in the Web3 Era	2022	Sudeep Krishnan	New Topics in Emerging Markets
Interoperability: Our exciting and terrifying Web3 future	2023	Park, Andrew ; Wilson, Matthew ; Robson, Karen ; Demetis, Dionysios ; Kietzmann, Jan	Business horizons
Digitalization in retailing: multi-sided platforms as drivers of industry transformation	2018	Mikko Hänninen, Anssi Smedlund, Lasse Mitronen	Baltic Journal of Management
Disruptive Technologies and Innovation in Hospitality: A Computer-Assisted Qualitative Data Analysis Approach	2023	Minwoo Lee, Annamarie D. Sisson, Rui Costa, Billy Bai	Journal of Hospitality & Tourism Research
A critical review of technology-driven service innovation in hospitality and tourism: current discussions and future research agendas	2023	Hyekyung Park, Minwoo Lee, Ki-Joon Back	International Journal of Contemporary Hospitality Management

A.2 List of journals by number of articles

Publication Journal	N° of papers	Publication Journal	N° of papers
International Journal of Retail & Distribution Management	3	International journal of physical distribution & logistics management	1
Journal of business research	3	International Journal of Research in Marketing	1
Journal of Theoretical and Applied Electronic Commerce Research	3	IOP conference series	1
Sustainability	3	Journal of Business Research	1
Journal of retailing	2	Journal of Electronic Commerce Research	1
Analele Universității "Dunărea de Jos" Galați. Fascicula I, Economie și informatica aplicata	1	Journal of Hospitality & Tourism Research	1
Baltic Journal of Management	1	Journal of Interactive Marketing	1
Business horizons	1	Journal of Retailing and Consumer Services	1
Congress on Intelligent Systems	1	Journal of Service Management	1
Electronic commerce research and applications	1	Journal of the Academy of Marketing Science	1

A.3 List of affiliation countries by number of papers

Rank	Authors' affiliation country	N° of papers	Rank	Authors' affiliation country	N° of papers
1	USA	9	16	UAE	2
2	India	6	17	Belgium	1
3	UK	4	18	Brazil	1
4	Canada	3	19	Colombia	1
5	Germany	3	20	France	1
6	Australia	2	21	Hong Kong	1
7	China	2	22	Malaysia	1
8	Finland	2	23	Morocco	1
9	Indonesia	2	24	Netherlands	1
10	Italy	2	25	Norway	1
11	Portugal	2	26	Pakistan	1
12	Russia	2	27	Romania	1
13	South Korea	2	28	Saudi Arabia	1
14	Spain	2	29	Slovakia	1
15	Sweden	2	30	South Africa	1

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