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Faculty of Business Administration and Management

Analysis of the carpooling sector in Spain focused on the
demand of young people

Master's Thesis

Master's Degree in Business, Product and Service Management

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Universitat Politècnica de València (UPV)

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Table of contents

Acknowledgements	2
Table of contents	3
Table of figures	4
Acronyms	7
1. Introduction	8
1.1 Motivation	8
1.2 Justification	9
2. Objectives.....	10
2.1 Research question.....	10
2.2 Main objective.....	10
2.3 Secondary objectives.....	10
2.4 Main definitions	10
3. Methodology	11
4. Context	13
4.1 Current mobility situation	13
4.1.2 Transportation problems	13
4.2 Old model.....	14
4.3 New model	15
4.3.1 Carpooling.....	16
4.3.2 Common benefits	18
4.3.3 Companies.....	19
5. Scenario.....	20
5.1 Users.....	24
5.2 Drivers.....	24

5.3 Problem definition.....	25
5.3.1 Low acceptance	25
5.3.2 Managing risks	25
6. Young demand	27
6.1 Category definition.....	27
6.2 Data collection	27
6.2.1 Sustainable Mobility Project. Part 1: Diagnosis of the situation (2015).	29
6.2.2 Sustainable mobility diagnosis in 2022. Universitat Politècnica de València.	34
6.2.3 Comparing both datasets.	40
7. Proposals	45
8. Conclusions and limitations	46
9. References	47

Table of figures

Figure 1. Data search infographics. Source: Scopus.	11
Figure 2. Taxis volume in Spain. Source: Europa Press.	14
Figure 3. Taxis volume in Spanish province capitals. Source Europa Press.....	15
Figure 4. Blablacar Business Model Canvas. Source: Blablacar.com	17
Figure 5. Blablacar’s VRIO analysis. Source: Blablacar.com	18
Figure 6. Commuting models in EEUU (2000-2020). Source: Bureau of Transportation Statistics, EEUU.....	21
Figure 7. Driving alone alternatives in the United States (2000-2020). Source: Bureau of Transportation Statistics, EEUU.	21
Figure 8. Daily transportation modes in EU (2000-2019). Source: Eurostat.	22
Figure 9. Daily transportation modes in Spain (1990-2019). Source: Eurostat.	23
Figure 10. Daily transportation modes evolution in Spain (1990 to 2019). Source: Eurostat.....	23

Figure 11. Transportation Statistics in EEUU in 2020. Source: Bureau of Transportation Statistics, EEUU.....	25
Figure 12. Surveys methodology. Sources: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València & Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.	29
Figure 13. Mobility choice in UPV students and young workers in 2015. Source: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València.	29
Figure 14. Carpooling % in UPV students and young workers in 2015. Source: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València.	30
Figure 15. Reasons students and young workers did not carpool in 2015. Source: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València.	31
Figure 16. Students and young workers predisposed to commute by carpooling in 2015. Source: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València.	32
Figure 17. Vehicle occupancy in 2015. Source: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València.....	33
Figure 18. UPV students and young workers mobility choice in 2022. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.	34
Figure 19. Carpooling users in 2022. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.	35
Figure 20. UPV students and young workers motives to not carpool in 2022. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.	36

Figure 21. Students and young workers vehicle occupancy in 2022. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.	37
Figure 22. UPV students and young workers willing to commute by carpooling in 2022. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.....	38
Figure 23. Reasons why students and young workers would commute by carpooling. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.....	39
Figure 24. Drivers' disposal to delay time for picking up passengers. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.	40
Figure 25. UPV students and young workers mobility in 2015 and 2022. Sources: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València & Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.	41
Figure 26. Vehicle occupancy in students and young workers cars in 2015 and 2022. Sources: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València & Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.	42
Figure 27. Percentage of people who commute by carpooling in 2015 and 2022. Sources: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València & Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.	43
Figure 28. UPV students and young workers willingness to commute by carpooling in 2015 and 2022. Sources: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València & Encuesta de movilidad	

sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València. 44

Acronyms

IoT. Internet of Things.

IT. Information Technologies.

MaaS. Mobility as a service.

UPV. Universitat Politècnica de València.

VTC. Vehículo de Transporte con Conductor (private car with driver).

1. Introduction

Due to the current environmental situation big cities around the world are encouraging new models of transportation to reduce pollution and traffic congestion. The necessity of a more sustainable use of transports has attracted many companies to develop new transportation models more responsible with the environment such as carsharing, carpooling or scooter sharing. All these new ways of mobility have in common that are provided by IT services usually through mobile phones, creating a new offer called Maas (Mobility as a service).

Carpooling is currently a new entrance model that reduce the traffic congestion sharing the car with somebody who travels to the same destination. In Spain there are some companies promoting this model, some of the most famous are Blablacar and Hoop, which are more related with long distances transportation. But in terms of reducing pollution carpooling has much potential in daily transportation like going to university or commuting. Unfortunately, current people are not too willing to accept this new way of transportation. Mistrust, uncertainty, and shyness are some of the behaviours that doesn't allow people to take these services as usual.

The aim of this research is to get insights of these new *Maas* models in Spain, and to understand the young people demand through analysing their necessities and expectations about carpooling. Is pretended to get an accurate vision of the current situation and to identify the issues that are blocking these new models to set up.

Key words: Carpooling, young people demand, transportation, *Maas*.

1.1 Motivation

The aim of this research is to collect insights about sharing mobility services and analyse the young population as a potential target of a sector which is experiencing a lot of changes during the past years. Specially in big cities, daily mobility signifies an important element on citizens life and commuting is part of every person life. Some people doesn't spend so much time going to work or University but most of the people in cities do and most of them through private vehicles, so that has a lot of bad consequences for cities such as traffic jams, and pollution. Hence any improvement of daily mobility in big cities would be a huge progress for society and welfare.

Market research about daily mobility, mobility choices, carpooling, and young target demand encourages and allows me to better understand a sector which is growing thanks to digital technology and connectivity. My motivation of working on this field came from the fact that is a

service that every person needs, and it is being transforming a lot thanks to Information technology.

1.2 Justification

From the past few years, a lot of companies based in smartphone applications have appeared in the transportation sector. Some of them are related to daily transportation inside the city such as Uber, Cabify or scooter sharing applications like Ecooltra or Acciona. And some others are more related with middle-long distance transportation such as Blablacar. The entrance of all these competitors have pushed old transportation services such as taxis or public transports to be more competitive and being present in IT technology specially in smartphones applications.

Furthermore, users' necessities have become much more demanding. Currently users expect to look, compare, and acquire any service through their smartphone. Moreover, users demand accurate information about any service and specially in mobility services the needs have become much more exacting. Nowadays users want to know about timelines, possible delays and costs, or any other information for comparing the different services and to choose the one that suits better their necessities.

Moreover, the spread of Covid19 has totally changed the mobility needs and priorities of people. Because of the pandemic, we have noticed deep changes in very service and specially shared mobility has suffered a huge decline in trust and confidence. Thanks to the collaboration of Universitat Politècnica de València we got access to transportation data before and after the pandemic that has been crucial to understand the mobility consequences of the virus.

2. Objectives

The main goal of this work is to better know which are young people mobility needs and priorities in order to have a better understanding about how carpooling companies must rule the service to catch more target and provide a better and reliable service that young people could use as a daily mobility choice, especially for commuting to university or work.

2.1 Research question

What are the necessities and preferences in carpool services for young people demand?

2.2 Main objective

To analyse the motives and barriers of using carpooling from the young people point of view and to identify how business should define their strategies to reach them properly.

2.3 Secondary objectives

1. To study the transportation necessities of young people.
2. To analyse University transportation surveys to understand mobility needs using students and young people as a target.
3. To define and compare the Spanish situation with other countries where carpooling is more established.
4. To bring new insights to better approach carpooling companies to young people demand.

2.4 Main definitions

1. Carpooling: Is a way of mobility that lets two or more people use one car to go from one point to another. By this way people can split the costs of the trip while reducing traffic jams and pollution.
2. Carsharing: Is a kind of mobility service that allow you to pick a car from one point, use it for a single trip and leave it in some other point. After your trip someone can take the same car to use it for a different trip. By this method people are able to drive without having to own a car.
3. Maas: Mobility as a service means the use of information technology to provide transportation services with reliable data such as timetables, prices and route tracking.

3. Methodology

In order to answer the research question having a deep knowledge of shared mobility and young demand behaviours a set of research documents have been studied. The goal of this literature is to better understand the carpooling services in Spain focusing on young people demand. The data analysis has been divided into secondary information sources, mainly taken from Scopus, and primary information that has been provided by the Universitat Politècnica de València as two surveys as insights of young people mobility needs.

Main documents used for the literature review have been taken from Google Scholar, Scopus, and Official databases of international governments such as EEUU and European Commission. Regarding Scopus references more than 200 different documents were collected by me and my tutors Maria de Miguel and Mónica Martínez Gomez through the application Mendeley Reference Manager. From my side, Scopus search started from a wide search using the key words “mobility” and “technology” to a deeper search using “traffic”, “service” and “carpooling” inside 2019-2021 filters. More isolated searches were also made using “carsharing” and “BlaBlaCar” as key words. Finally, more than 100 documents were collected and after reading both abstract and introduction a sum of 52 final documents were used as insights.

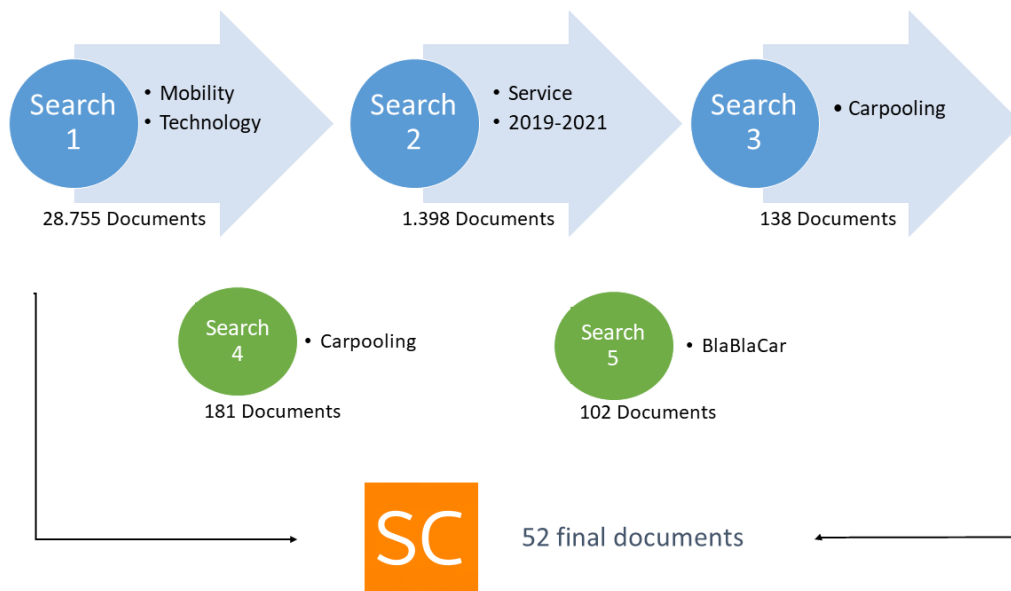


Figure 1. Data search infographics. Source: Scopus.

Regarding secondary information used for the literature review Olsson, Maier & Friman (2019) and Xingyuan & Jing (2021) have been used as insights to recognize people willingness, compartment and appreciation of shared mobility as a daily transportation service. On the other hand drivers’ behaviour understandings were collected from Annie & Georgia (2021) research.

Information related to Smart cities, IoT¹, and app-based services has primarily been taken from documents Gilibert & Ribas (2019); Anthopoulos & Tzimos (2021) and Turon & Kubik (2021). Regarding young people demand insights from König, ChristinaWirth & Gripp (2021) research has been used as a main resource. Documents mentioned before have been the most used and important ones for this research but not the uniuques. Many other documents have been essential to have a big picture about the mobility situation and scenario of the past few years and how technology has erupted into the sector to generate new models that currently compite with those services that have been settled for long time.

Regarding primary information about young people demand, two surveys provided by Universitat Politècnica de València have been used: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València; and Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València. Thanks to Polytechnic University of Valencia, we could add additional questions to the survey launched in April 2022 in order to get answers deeply related to commuting by carpooling. Both surveys represent quantitative and qualitative data related to transportation and commuting which provide us worth insights about the transportation necessities and willingness of the sample. Both datasets were given as a row data in excel format. Then pivot tables and pivot charts havd been created to show up the information and compare the different periods.

¹ A service that connects different devices and enable them to interact and transfer data

4. Context

The rising of traffic in western cities has always been a huge problem in terms of pollution, congestion, stress, and parking space. Over the past few years, the evolution and overdevelopment of many undeveloped countries has multiplied these problems and spread them around the world. Specially pollution is currently one of the most important challenges we must deal with and is directly related with transportation. Hopefully, people are day to day more concern about the environmental situation, and many governments have started taking measures like promoting the purchase of electric and hybrid vehicles or investing in public transportation infrastructure (Dubolazova, 2020).

According to Olsson, Maier & Friman (2019), traffic jam in big cities is one of the main factors that causes stress in people. Currently lifestyle requires a lot of daily activity inside cities, and cities still need new mobility models that make transportation more efficient.

4.1 Current mobility situation

In the past few years, mobility private sector has been growing in app-based on-demand shared transportation models such as renting a car by minutes (carsharing) or taking a ride in a shared car (carpooling). Summarizing, we have seen a huge change on mobility sector from a limited transportation offer to a new scenario which includes many different models based on mobility-on demand (Oliveira, et al., 2020).

4.1.2 Transportation problems

Currently, transports are responsible for about one-third of the total energy consumption in Western countries (Ren, et al, 2020). Fortunately, worldwide population is becoming more conscious about climate change and CO2 emissions and nowadays many governments around the world are supporting measures to avoid global warming and benefiting companies that are involved on sustainability. Consequently, several investors are proposing new transportation models promoting sustainability and efficiency. In addition, mobility market requests the use of new technologies such as IoT, Big Data, Smartphones, and data connectivity to enable users to have short-term access to a mobility service when required. Nevertheless, private cars are still the principal choice for most of the population in big cities. Flexibility, commodity, and availability are the principal advantages by which people are still using their own car (Annie & Georgia, 2021).

The actual spread of new mobility models is due to both social and environmental concerns and the technology advancement. But unfortunately, problems such as traffic jams,

pollution and high rates of motorized vehicles will not be completely solved just because of these new modes of transportation, nevertheless it can help to relieve (Moritz, 2019).

4.2 Old model

During the last few years daily transportation service in Spanish cities has been mainly ruled by taxis and public transportation such as bus, train, or metro. Hence in terms of private companies' taxis have been almost monopolising the mobility sector until the arrival of new entrants such as VTC (de Miguel Molina, de Miguel Molina, & Catalá Perez, 2021). However, due to the improvement of public transportation and the arrival of new competitors the volume of taxis has been slowly decreasing from the last 20 years (Figure 2). The following chart has been taken from the website Europa Press (2022) and regards to the evolution of taxis in Spain from 1995.

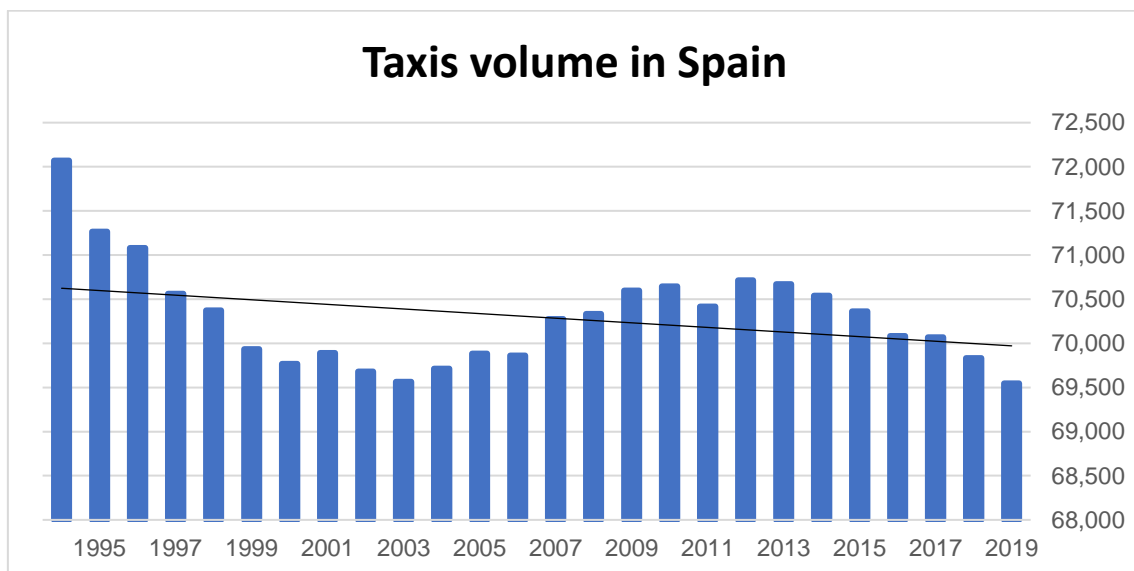


Figure 2. Taxis volume in Spain. Source: Europa Press.

Even though not every year has supposed a decrease the trend is clearly negative. Considering the increasement of Spanish population, the growth of the size of the cities, the high volume of tourism Spain has, and the increase of daily mobility needs in people who lives in big cities does not seams coherent a decree of taxis. There is evidence that mobility as a service is changing and pushing old models to transform their standards to be competitive and attractive to users.

Figure 3 (Europa Press, 2022) shows to the evolution of taxis in Spanish province capitals from 1995 to 2019.

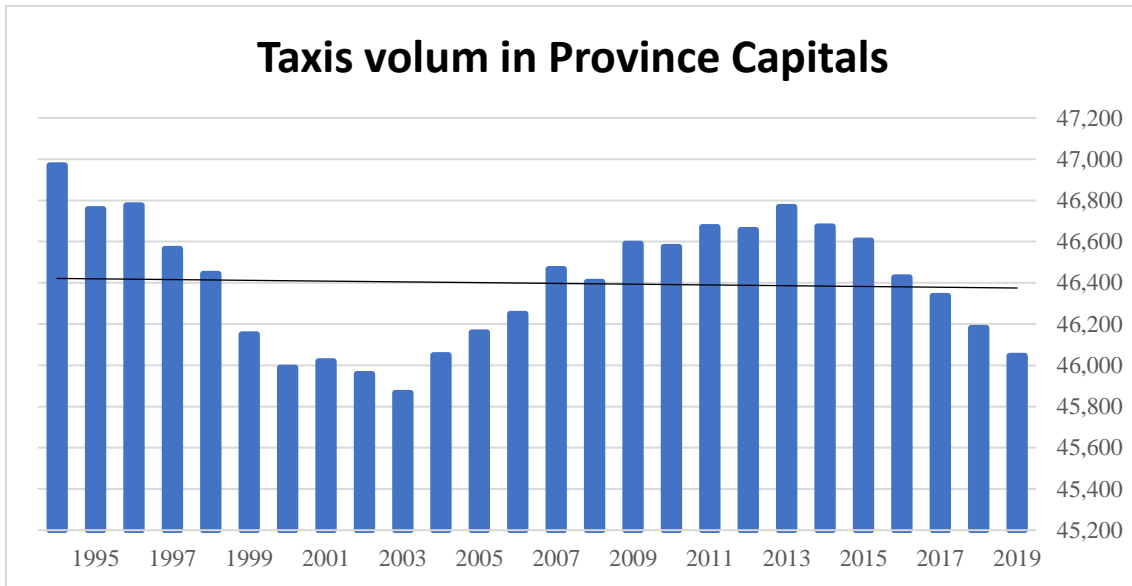


Figure 3. Taxis volume in Spanish province capitals. Source Europa Press

Compared to Figure 2, the evolution of taxis in province capitals has not suffered such big decrease. We must understand that big cities are much more depending on taxis than smaller ones but at the same time is where there are more competition and where the new entrants try to launch their businesses. However, regarding Figure 3 we understand that taxis in big cities are not too sensitive to the new entrants, but we have to take into account that there is still a decreasing trend in the number of taxis in big cities from the past 25 years.

4.3 New model

Over the past few years, many companies have invested in new models of transportation services providing mobility solutions through digital platforms based on new people's needs. This innovation is due to the current socio-technical situation given by the massive use of Internet and the arrival of smartphones. These new models are called as MaaS. It includes every transportation service which are based on customer needs, and uses a digital channel to plan, book and pay. Therefore, it is necessary for these platforms to integrate and share high quantity of data such as location, timetables, users' data... (Gilibert & Ribas, 2019).

Nevertheless, a platform-based model is not enough to compete against old transportation modes. To reach a considerable market share the service must be inclusive for all economic background, accessible to everybody, to ensure the safety of the users, to be respectful with the environment and to know about users' necessities. Although mobility service companies are growing so fast, users may be customers of more than one company and have many mobile applications to cover all their transportation needs on time. Currently, MaaS companies use to

provide their services in their own application, therefore they do not optimise technology costs and force users to have many different applications in their mobiles, which is not very much user efficient (Altshuler, et al 2019).

4.3.1 Carpooling

Carpooling is a type of MaaS where drivers share their vehicles for a trip and divide the costs with the rest of the passengers. It has mutual cost benefits for both drivers and passengers, moreover it contributes to decreasing levels of traffic congestion and pollution but unfortunately users have many difficulties in finding drivers with matching timing and routes (Perkumiene, Vienažindiene, & Švagždiene, 2021). Currently, carpooling is well known for long distance travels, but it has much more potential for daily transportation such as commuting or going to university. Generally, drivers and passengers have the same itinerary and schedule but sometimes drivers can accept some changes on the route (Xue-Dong, et al, 2021).

Drivers are not considered a private organisation and their objective is not to get profit of it but to divide the travel costs and contribute to reducing Co2 emissions. Therefore, carpool users are both drivers who offer a vehicle site and people who request transport as a passenger. (Annie & Georgia, 2021). The most common method for most of the carpooling companies is a destination based. On this method drivers decide both route and schedule. Passengers consult the different trips and request the driver for the service, and finally, drivers choose the one that better fits their needs (Gilibert & Ribas, 2019).

From a general view, carpooling services involves three main agents which are drivers, passengers, and smart cities. The value is generated by the connection of drivers and passengers through a service provided by a platform which performs in a city where technology has an important role to play. Here below is a generic business model canvas regarding carpooling.

The business model canvas (Figure 4) considers drivers and passengers as co-creators of value at the same time as beneficiary, while smart cities role is both provider and partner of the carpooling company. The service is offered by a platform which resources are technological aspects such as Internet of things, cloud computing, sensor networks and 5G, therefore technology acts as a main resource. On the other hand, the brand is also a considerable resource from the trust point of view, especially for passengers.

Business Model Canvas for Blablacar				
Key partners	Key activities	Value proposition	Customer relationship	Customer segments
-City government -Smart city services -Platform	-Facilitate ride matching process -Maintenance of platform services -Platform risks management	-Commuting cost reduction -Commuting time reduction -Real time rides matching	-Users engagement -Users loyalty	-Individual drivers -Individual passengers
	Key resources	-Interconnection with smart mobility services	Channels	
	-Technology -Brand -Data	-Security and trust	-Digital platform	
Cost structure		Revenue streams		
-Platform development -Platform maintenance -Marketing		-Participants subscription -Commissions -Selling users data		

Figure 4. Blablacar Business Model Canvas. Source: Blablacar.com

In terms of strategy, carpooling companies are mainly recognised by having strong IT and customer service competences that make the service able to provide on time data like timetables, costs, and track road. Consequently, the service has more economic value and take advantage over taxis or any other rival. Using VRIO business Framework we can easily understand how carpooling companies are using its resources to take competitive advantage and beat competitors. Figure 5 reveals the VRIO analysis of Blablacar as an example of a carpooling company.

V <i>Valuable</i>	R <i>Rare</i>	I <i>Inimitable</i>	O <i>Organized</i>	
<i>No</i>				<i>Competitive disadvantage</i>
<i>Yes</i>	<i>No</i>			<i>Competitive parity</i>
<i>Yes</i>	<i>Yes</i>	<i>No</i>		<i>Temporary competitive advantage</i>
<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>No</i>	<i>Unused competitive disadvantage</i>
<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Sustainable competitive advantage</i>

Figure 5. Blablacar's VRIO analysis. Source: Blablacar.com

Blablacar's core competences such as brand image, social responsibility, and the fact that they are innovating a new model of transportation give value to the company and helped it to emerge in a new market as a first entrance. As rare competences Blablacar has settled in different countries around the world and being able to adapt their model in countries with distinct cultures. That ability implies a strong and flexible abroad strategy. Thanks to be one of the early entrants in this new model of mobility they have had more time to focus on quality and customer experience which now are one of their core and inimitable competences. In terms of organization the fact that Blablacar is a service based in an application and has integrated technological advancements such as location time represents a very strong advantage in terms of operations and processes (BlaBlaCar, 2022).

4.3.2 Common benefits

In a general view, carpooling incentives private vehicles occupancy reducing the individual use of cars while reducing traffic congestion, improving cities environment, and enhancing social life. From a user experience perspective carpooling allows you to save costs and time while travelling, therefore young people are specially attracted because they recognize carpooling as one of the cheapest and most comfortable ways of transport (Ling-Ling, et al, 2021).

4.3.3 Companies

Nowadays there are two big referents regarding carpooling, Waze and Blablacar. There is also a start-up called Journify, which born at Universitat Politècnica de València, and it is day to day more established in the Spanish market.

Waze

It allows drivers to drive for free or to be compensated depending on the kilometres they drive and the government reimbursement rate according to the city they are. Regarding their website Waze is a mobility company application based which is mainly focus on showing realtime traffic situation. Their core values are reducing traffic and facilitate the best possible routes for drivers (Waze, 2022). However, even though real time traffic is their main service their also have carpooling.

Blablacar

It is a money-based application where drivers post trips and prices, and passengers have the opportunity of buying seats on the vehicles. Blablacar is mainly recognised as the leading carpooling company settled in more than 20 different countries mostly European countries (BlaBlaCar, 2022).

Journify

Journify is a start-up developed in the Universitat Politècnica de València that is focused on sustainable mobility. It was founded in 2017 and its aim is to reduce traffic congestion using carpooling as mobility service. There are basically acting as a application based service providing matches between drivers and passengers favouring their connection and allowing them to travel together (Journify, 2022).

5. Scenario

The continuous increase of internet technology and smartphones enable online platforms to facilitate ride matching process and to lead the expansion of new transportation models such as carsharing and carpooling. Some governments are taking advantage of this technology to become smart cities aiming to solve transportation problems while improving life quality of the citizens. A smart city is a city which develop and promote the role of information and communication technologies (ICTs) in a forward-looking way involving economy, people, governance, mobility, environment and living. Hence, smart cities recognize the role of information as a key to develop new transportation solutions more efficient and sustainable for the environment and the citizens (Leonidas & N. Tzimos, 2021).

But unfortunately, not every city/government has perceived the eruption of these mobility models as an improvement. Governments of big cities are continuously managing the law to avoid conflicts between car sharing/pooling companies and taxis or others old model transportation companies that perceive new entrants' models as a threat. Indeed, some cities like New York or London have established very strong restrictions even banned car sharing companies. However, it seems clear that on-demand services through digital platforms are more efficient in terms of routes optimization, and real-time information than old transportation models (Gilibert & Ribas, 2019).

The change from “using your own car” to “using a shared vehicle” is a kind of disruptive innovation that may have bad consequences for many companies, especially those who are related with old transportation modes and are not willing to innovate and adapt their businesses into the digital era. Therefore, this transition must be properly ruled by local governments in order to avoid unfair competition. Some of the key aspects of these regulations are taxes, safety issues and cover city area (Soraes Machado et al, 2018). Sadly, despite all improvements on digital technology for transportation services some researchers say that companies are not totally fitting users' needs due to a lack of cooperation between companies and cities governments (Turon & Kubik, 2021).

Concerning carpooling situation in the developed countries, we appreciate a low popularity even though it brings us many benefits. In United States carpooling provide users with time and costs benefits such as access to high occupancy vehicle lane or tolling discounts, which are very considerable advantages whether people who live in crowded cities or people who has not a high income. Although above benefits United States percentages of carpooling throughout the past years has been really limited and steady. Figure 6 shows the percentage of use of alternatives to driving alone, which data is steady around the 75%-80% of usage.

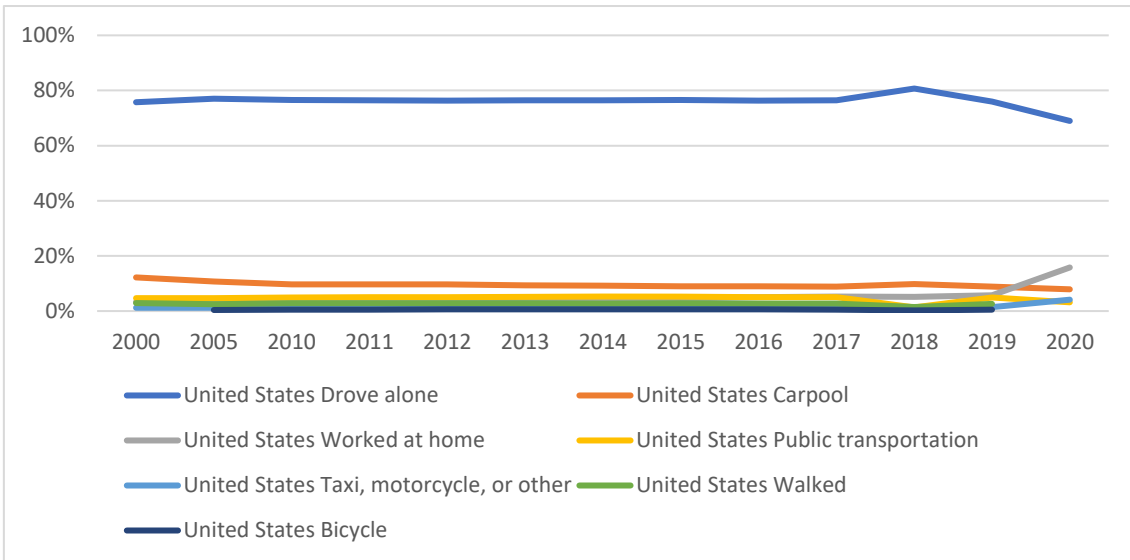


Figure 6. Commuting models in EEUU (2000-2020). Source: Bureau of Transportation Statistics, EEUU.

According to Figure 6, the mobility choices in EEUU has been very stabilized from the past 20 years. Even though EEUU is a world reference in terms of technology and welfare carpooling is far from being a considerable option and an opportunity to decrease the number of cars in the cities.

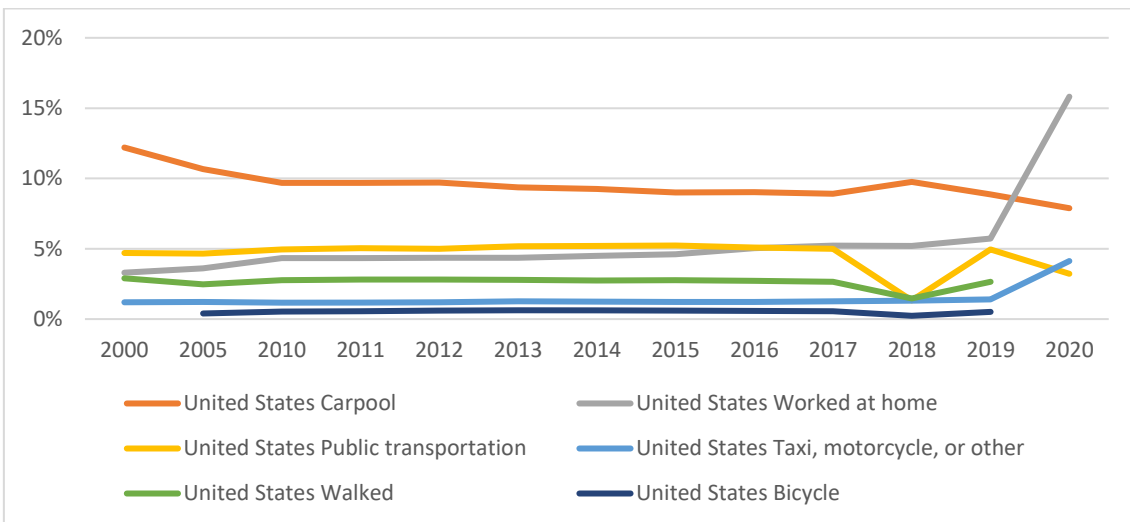


Figure 7. Driving alone alternatives in the United States (2000-2020). Source: Bureau of Transportation Statistics, EEUU.

Figure 7 shows a low but unexpected decrease of carpooling over the past 10 years. Although United States is one of the most security and technology developed country most of the people is not so willing to accept carpooling as a daily transportation option. On the other hand, European countries are not so far from United States percentages although their governments have

been promoting several measures aimed to stimulate carpooling and reducing traffic congestion in cities. Some of these measures were the Increase of Car Occupancy (ICARO, 1997) and City-Vitality-Sustainability (Leonidas & N. Tzimos, 2021). Figure 8 shows the commuting transportation alternatives in European Union countries among 2000 and 2020. This data has been taken from the European Commission website Eurostat.

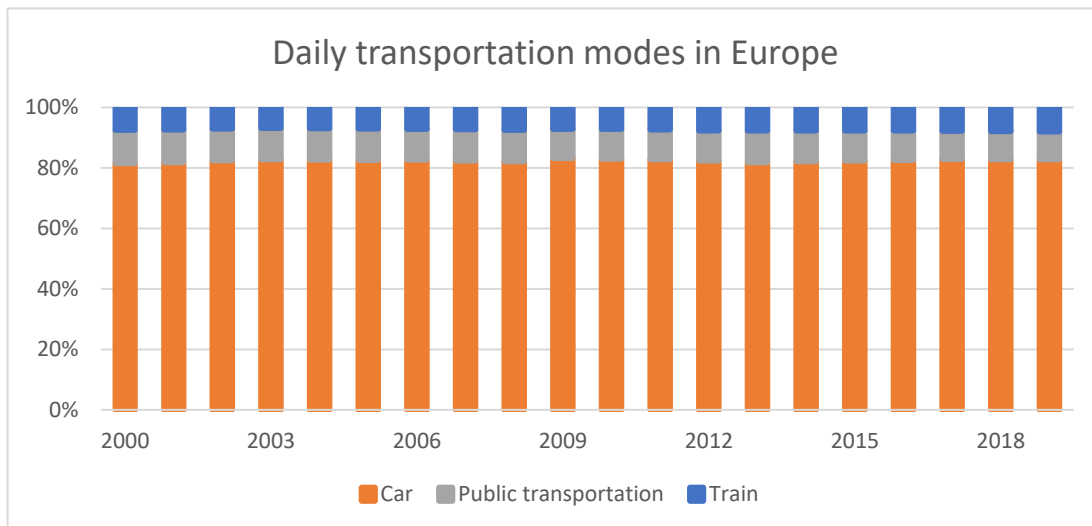


Figure 8. Daily transportation modes in EU (2000-2019). Source: Eurostat.

We can appreciate data has been maintained static over the past 20 years. As an average car is the most usable vehicle in daily transportation, meaning an 82.5% of the grand total. Next is public transportation, which is 10.1% of the grand total. And finally, people who takes a train daily represents the 7.4%.

Concerning Spanish information, data set has been taken from European statistics, Eurostat Data Browser, Spain, 2022, and it reveals a very similar situation to the rest of Europe while an impressive static situation over the past 30 years. The below figure shows an average of 81.7% of the grand total takes their own car for daily transportation, while 12.6% takes public transport and finally the 5.7% of the grand total moves by train.

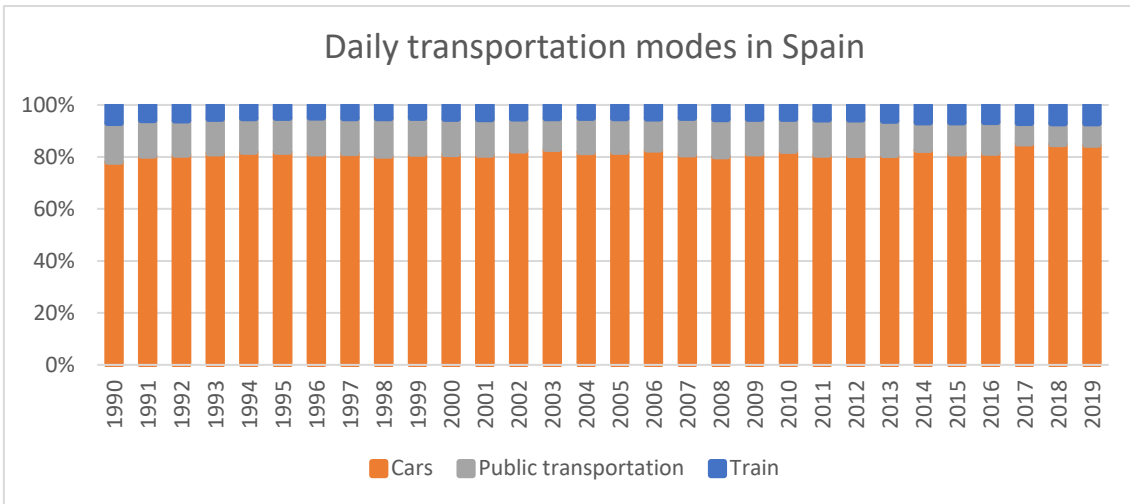


Figure 9. Daily transportation modes in Spain (1990-2019). Source: Eurostat.

In Figure 9, we can appreciate no significant movements over the past 30 years. It means not many people has changed their transportation mode therefore people are not willing to change while new generations are reproducing the same decisions over taking daily transport. In Figure 10 we can appreciate a comparative graph between 1990 to 2019. It shows the evolution of daily transportation choice in the past 30 years.

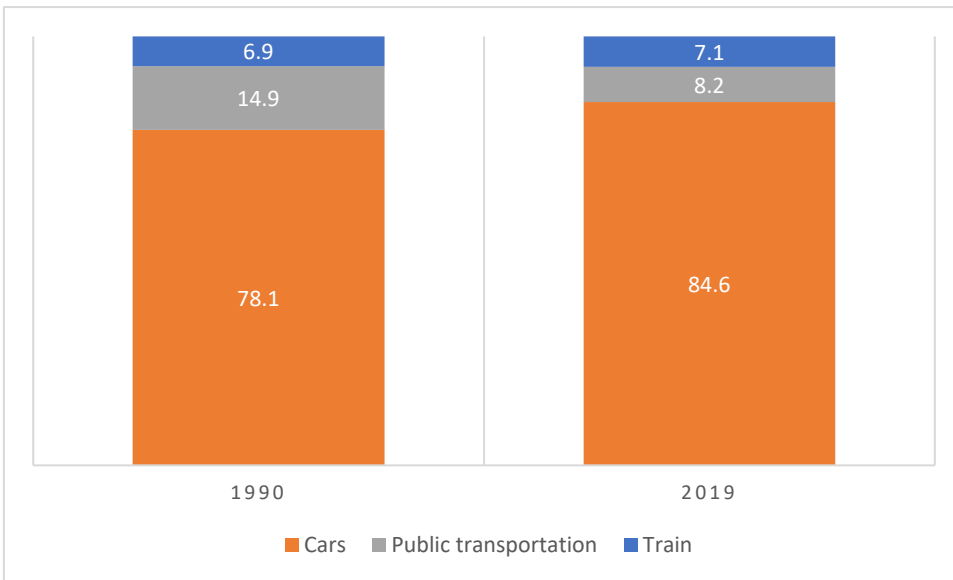


Figure 10. Daily transportation modes evolution in Spain (1990 to 2019). Source: Eurostat.

Unexpectedly, cars usage has increased 6.5 percentage points while public transportation has decreased 6.7 percentage points. We must consider pandemic spark in 2019 made many people stopped using public transport during many times but data showed on figure 10 shows

similar percentages on 2018 data. Definitely, the result is the consequence of a continuous increase of driving alone as the preferable option among Spanish and European people.

5.1 Users

The reasons users take shared transportation models instead of old model transportation are basically summarized into ecological concerns and technological advances, but there are also several reasons that also explain the urban transportation sector change such as economy, lifestyle, and convenience. (Soraes Machado et al, 2018).

Once a user chose to use shared mobility he or she must decide among many different offers. The main elements in this decision are the travel time and the expense of the trip, and usually the final decision depends on the trade-off of both elements. Generally, costs use to guide such decision, especially for young people who have not too many incomes. Nevertheless, there are some situations when travellers' values of time take precedence on the decision, and it does not matter whether your economic situation is good or not. It specially happens for commuting or anytime users have a delay on the departure time, and they do not want to assume the risk of being late. In these situations, users have higher value of time hence are less sensitive to driving cost. Therefore, we can ensure that in some situations travel time prevail over the expense of the trip although users have not a good economic situation. Nevertheless, if users value of time is very high, they may decline to use shared mobility which means that currently we do not trust enough this service in terms of timing and reliability (Xingyuan & Jing, 2021).

5.2 Drivers

In terms of Carpooling there have been a lot of research related on passenger's behaviour and needs, nevertheless there are not many related-on driver's necessities and preferences. Unfortunately, people are more reluctant to use carpooling as a driver rather than as a passenger and that may be one of the principal inconvenient of carpooling to fully set up as usual mobility service (Annie & Georgia, 2021).

Carpooling companies must better understand drivers' necessities for increasing their willingness to accept passengers. Security is in most of the cases the principal reason people are reluctant to be a carpool driver, on that field companies use advanced technology to provide drivers with the necessary passenger's data and allow them to have the decision of accepting or not any profile (Olsson, Maier, & Friman, 2019).

In terms of motivation, each driver is attracted by many different incentives. The majority do carpool to split travel costs, but some others are attracted by benefits outside the carpooling

platform such as parking offers, to access to highway special lanes, or even because of the chance to meet new people and socialize.

5.3 Problem definition

5.3.1 Low acceptance

Even though technology improvement facilitates a lot the increase of carpooling offer and the ride matching process it is so far to set up as a usual transportation service, especially for daily mobility as commuting. Figure 11 shows how far carpooling is to be a common solution for commuting in United States, which is one of the most technologically developed country (Bureau of Transportation Statistics, Department of Transportation, United States Government, (2020).

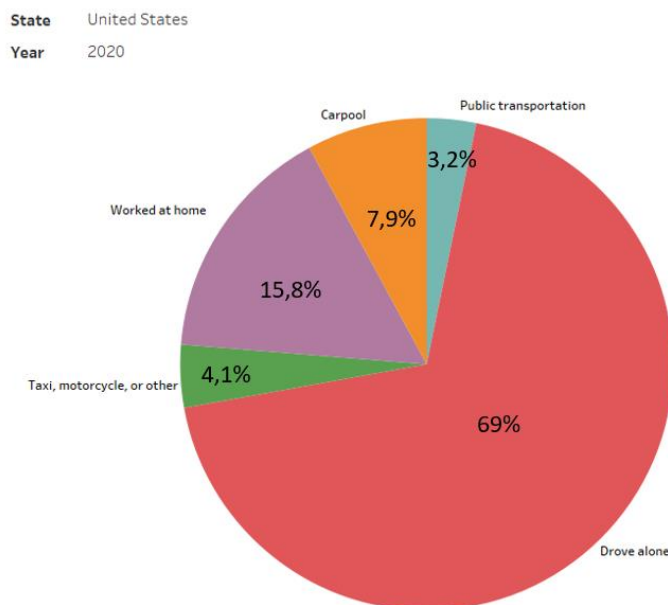


Figure 11. Transportation Statistics in EEUU in 2020. Source: Bureau of Transportation Statistics, EEUU.

5.3.2 Managing risks

One of the most important problems carpooling companies must deal with are managing bad reviews from both users and drivers. Nowadays, internet reviews are a considerable factor that measure a company performance and affects significantly in customers decision. For this reason, carpooling companies must manage properly the risk of having negative criticism from bad customers or suppliers who may be opportunist for their own benefit (Tingting & Cynthia, 2012) and (Li & Bai, 2021).

Another important risk to take into account is to not have enough customer's trust. In mobility services customers use to have strict timetables, and delays are risking that people are not willing to pay. Hence transportation is a service that must have the full trust of customers, especially in commuting, otherwise people will never use that service as a daily option. Carpooling companies must consider seriously this point punishing or even banning users who do not respect schedules to avoid mistrust problems (Yujie, et al, 2017).

6. Young demand

According to Soraes Machado et al (2018), most of the shared mobility businesses failed because users tend to decide by their own interests which principally is economic and many of the shared mobility companies that failed were community-based initiatives or private companies too focused on environment which prices were not so competitive. The main objective of this research is to better understand young people demand for approaching carpooling businesses to the target necessities and expand the number of users (Xingyuan & Jing, 2021).

Young people demand is currently a target with a huge potential due to the facts that they are more conscious about climate change, their economy is not too powerful, and they are much more willing to socialize and meet people than elder people. Moreover, young people have a lot of mobility needs, especially regarding daily mobility. Going to university or commuting to work are the main examples of daily mobility needs young people have (König, ChristinaWirth, & Gripp, 2021) and (Mote & Whitestone, 2011).

6.1 Category definition

Most papers identify young demand as people among 18 to 30 years old who use to be university students, interns, and workers in their first employment experiences. Commonly, these people are characterized by not having many economic resources, having a huge use of technology on daily life and being willing to socialize with strangers (Zheyi & Ping, 2017). That target has a vast potential for carpooling services; hence, universities could be a key partner to get target insights. Companies and universities must collaborate in that way, creating an open innovation environment to get understandings and approach service to people (Thomas, 2019).

6.2 Data collection

Thanks to tutors Maria de Miguel Molina and Mónica Martínez Gomez, the Universitat Politècnica de València provided us information about UPV Sustainable Mobility Project developed by Novotec Co. which is a company that develops engineering projects based on sustainability and safety work. The project is divided into 2 parts and has been used as data collection of young people demand. First part is an initial diagnosis of mobility situation at university in 2015 (València, PLAN DE MOVILIDAD SOSTENIBLE. DIAGNÓSTICO DE LA SITUACIÓN INICIAL, 2015). The second part (València, Encuesta de movilidad sostenible a la comunidad universitaria de la UPV. Diagnóstico de la Movilidad Sostenible de la UPV, 2022) refers to a second survey launched in 2022 in order to collect data about students and young people commute.

Figure number 12 shows up the methodology and data structure of both surveys. Initially we wanted to use just the data from student's answers but after realized that the sample was not too representative we decided to add young workers of UPV.

Scope of study	Young people
Population	UPV students and workers
Sample	UPV students and young workers
Geographic coverage	Valencia, Alcoy and Gandia
Regularity and continuity	7 years
Sample size	3.317

Figure 12. Surveys methodology. Sources: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València & Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

6.2.1 Sustainable Mobility Project. Part 1: Diagnosis of the situation (2015).

The document Diagnosis of the situation (UPV, 2015) has contributed to get insights of mobility solutions, besides the fact that contains a survey focused on young people mobility. On the following pages we can find survey results and analysis of commuting situation at UPV in 2015.

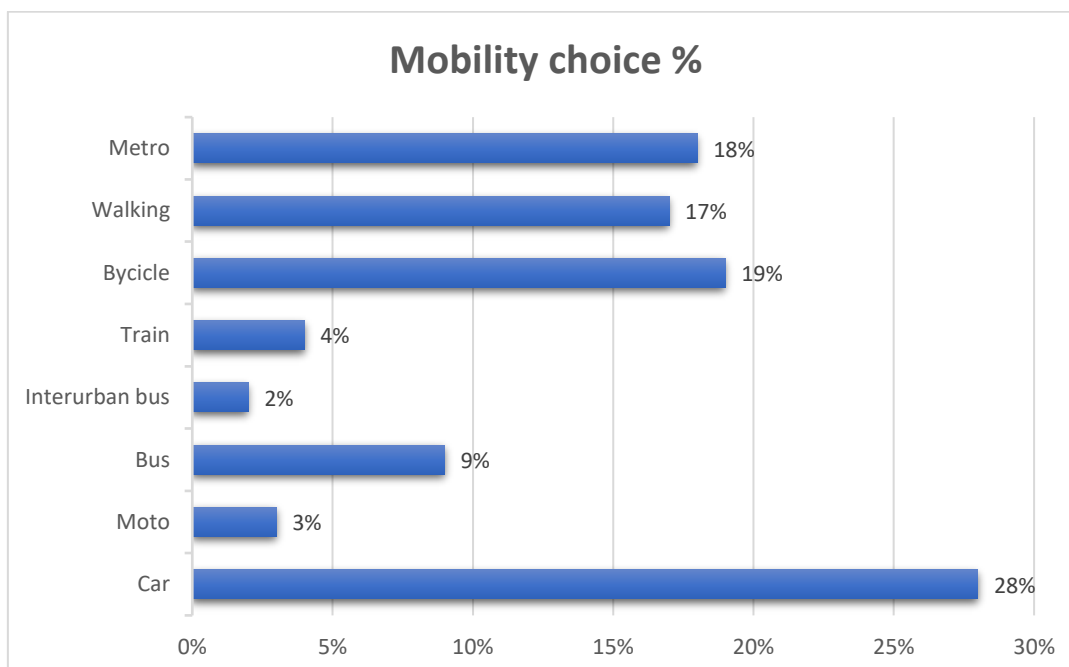


Figure 13. Mobility choice in UPV students and young workers in 2015. Source: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València.

Regarding Figure 13, we can see that most of the students and young workers commuted by car. A part of driving a car, metro, walking, and bicycle were the most common ways to go to university in 2015, and all of them reached around 17% to 19%. However, if sum every public transportation service it would reach a 33% being the most used way of transport and after that would be car with a 28%.

Taking car users as population below chart shows the percentage of drivers that commute either alone or with someone.

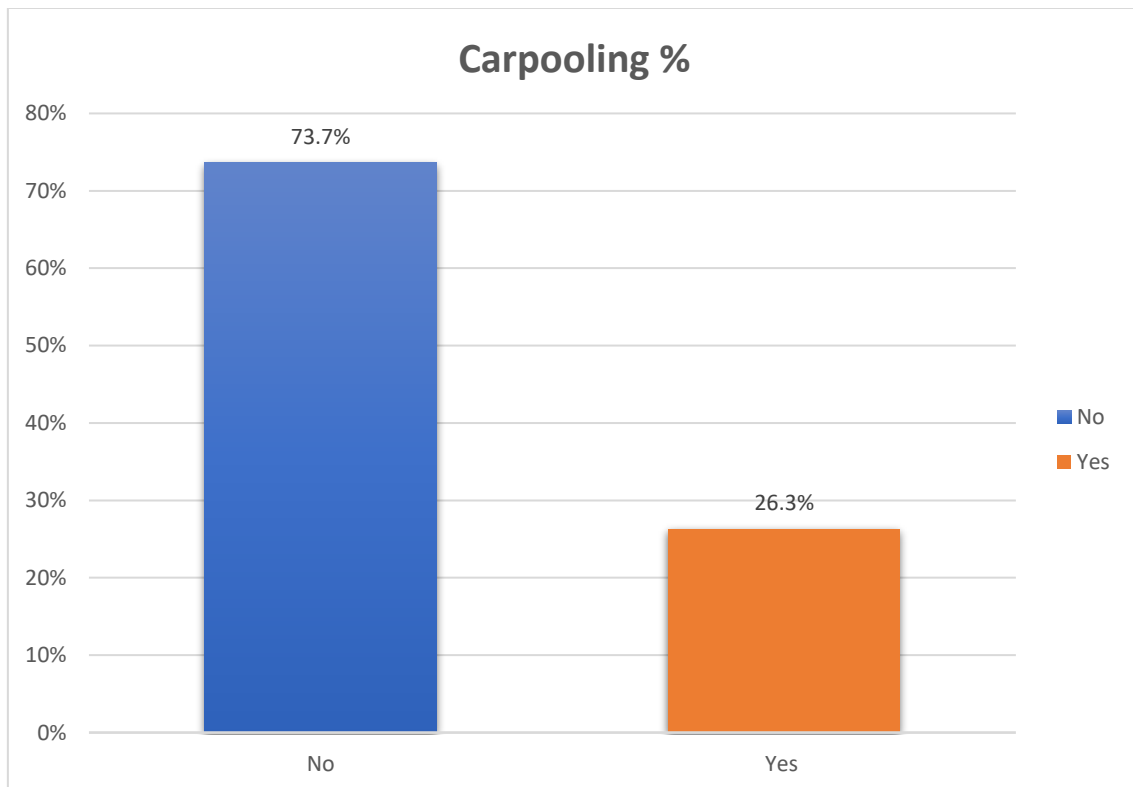


Figure 14. Carpooling % in UPV students and young workers in 2015. Source: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València.

Considering Figure 14, more than ¼ of the sample that commuted by car in 2015 were sharing at least one place. This result may be given because of multiple factors such as mistrust, comfort, or the fact that it might be difficult to find someone who suits either drivers' routes or schedules.

Regarding these factors, the following doughnut chart shows the reasons why drivers population were not carpooling.

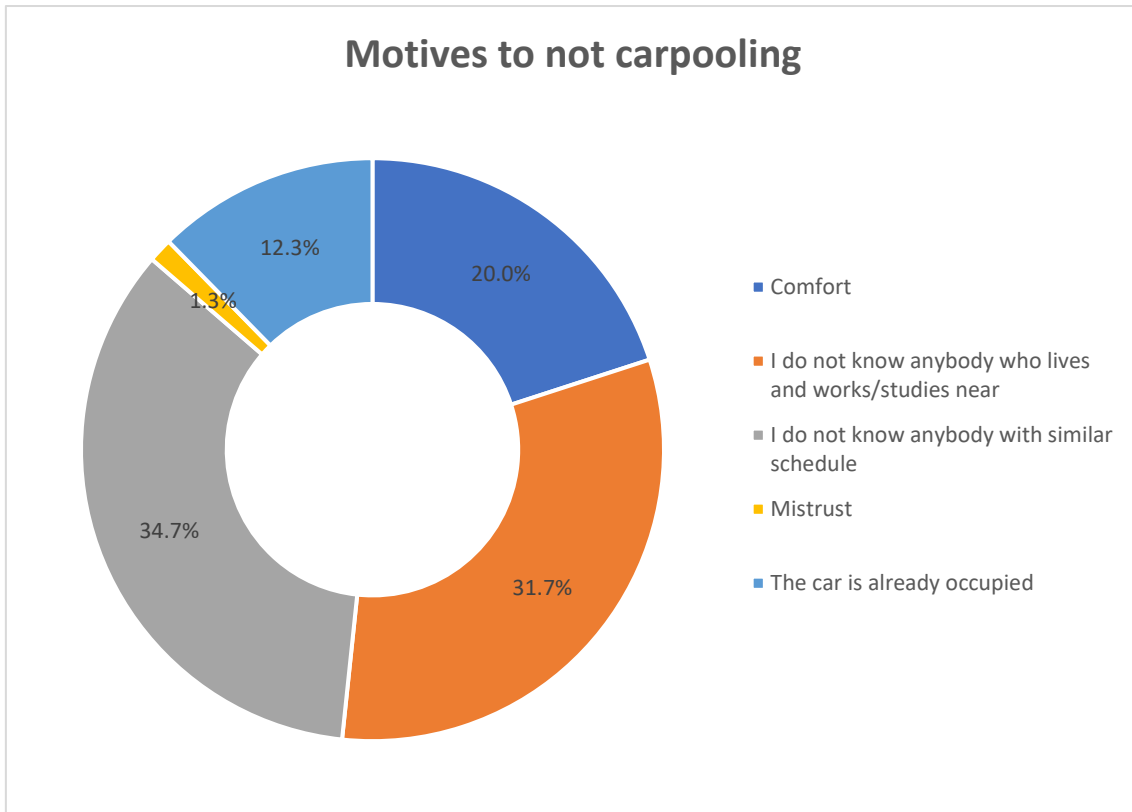


Figure 15. Reasons students and young workers did not carpool in 2015. Source: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València.

Mistrust represents just a 1,3% of the population, which is not so important, but on the other hand 20% of the drivers considered comfort as their reason to not carpool. That answer is very significant because means that 1/5 of the drivers are not too willing to share their vehicle just because they value the commodity of being alone. That point is really relevant because we are talking about a population around 18 to 25 years old, therefore the fact that comfort has such value for young people has to be thoroughly studied in order to make them change their preferences and make carpooling more attractive for them.

The most repeated motive to not carpooling was the fact that people did not know anybody with the same schedule, followed by people who did not know anybody who lived close to them. Both answers represent more than the 60% of the non-carpooling population which means that the main reason for not carpooling in 2015 was closely related to the fact that was difficult to find people in your neighbourhood with similar schedules that allow you to link routines and share your vehicle. Nevertheless, most of the survey population were willing to carpool for commuting although the difficulties of finding drivers or passengers who fits your routines. Below column chart shows the percentage of the UPV students and young workers who were predisposed to commute by carpooling.

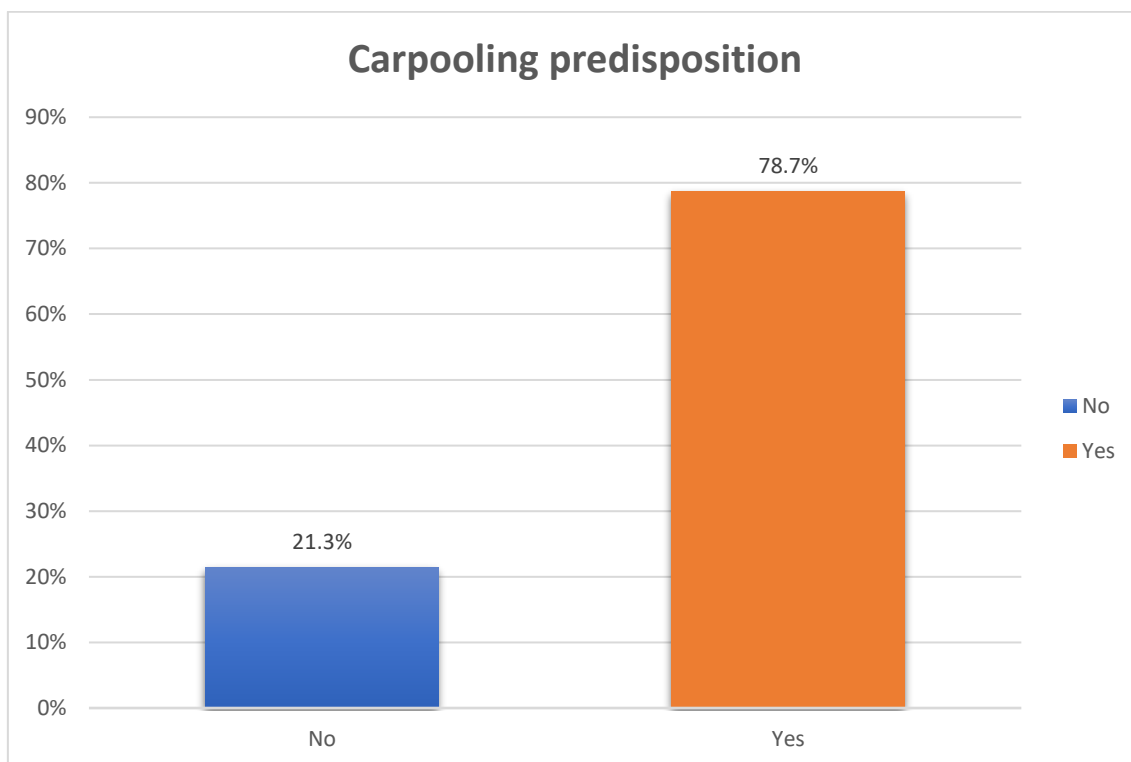


Figure 16. Students and young workers predisposed to commute by carpooling in 2015. Source: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València.

According to Figure 16, almost an 80% of UPV students and young workers were willing to use carpooling as their transportation way for going to the university in 2015. This statement and the fact that the 60% of the students that were not carpooling means that there would be a huge carpool users increase if they had a bigger network to find people with similar needs in terms of schedule and location. Therefore, there is a big room for improvement despite the fact that 1/5 students are not willing to carpool because of comfort.

Regarding Figure 17, 73% of the sample that commute by car are using the car by their one and the rest are commuting with one or more people. It shows how full UPV students' cars were in 2015.

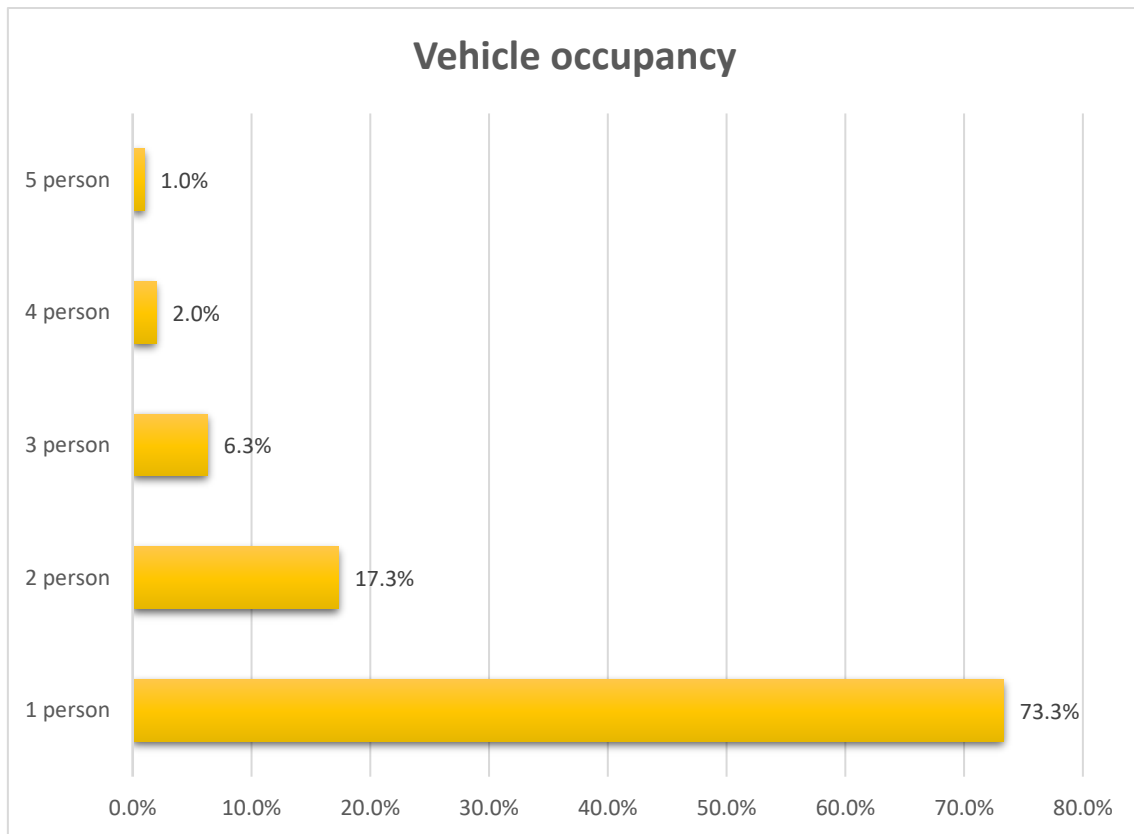


Figure 17. Vehicle occupancy in 2015. Source: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València.

Figure 17 shows the vehicle occupancy percentage of UPV students and young workers in 2015. The chart reveals that most of the people who share their vehicle were just sharing with one person, and just 1% of the cars is occupied by 5 persons. Seeing these data after knowing that more than the 78% of the population were willing to carpool, we can figure out that there were a lot of difficulties to find either drivers or passengers with who match agendas. It is well known that in 2015 carpooling applications and websites were not so common for UPV students hence the majority of them were carpooling with people they already knew instead of doing it with whoever suits location and timetables.

As a conclusion, we can realize that most of the sample knew well about the advantages of carpooling therefore the majority were willing to do it but there was a lack of communication and solutions that complicated the matches being too difficult to find people with the same interests to carpooling.

6.2.2 Sustainable mobility diagnosis in 2022. Universitat Politècnica de València.

Seven years after the first data collection of the diagnosis of the situation for the Sustainable Mobility Project in UPV, a second study has been launched in April 2022. Many of the questions related to mobility were the same as the survey in 2015 therefore it is easy to take a look into the new results and compare them with the previous survey. The following information comes from that second survey called “Encuesta de movilidad sostenible a la comunidad universitaria de la UPV. Diagnóstico de la Movilidad Sostenible de la UPV, 2022”.

Below charts give a big picture about mobility situation in every UPV campus in 2022.

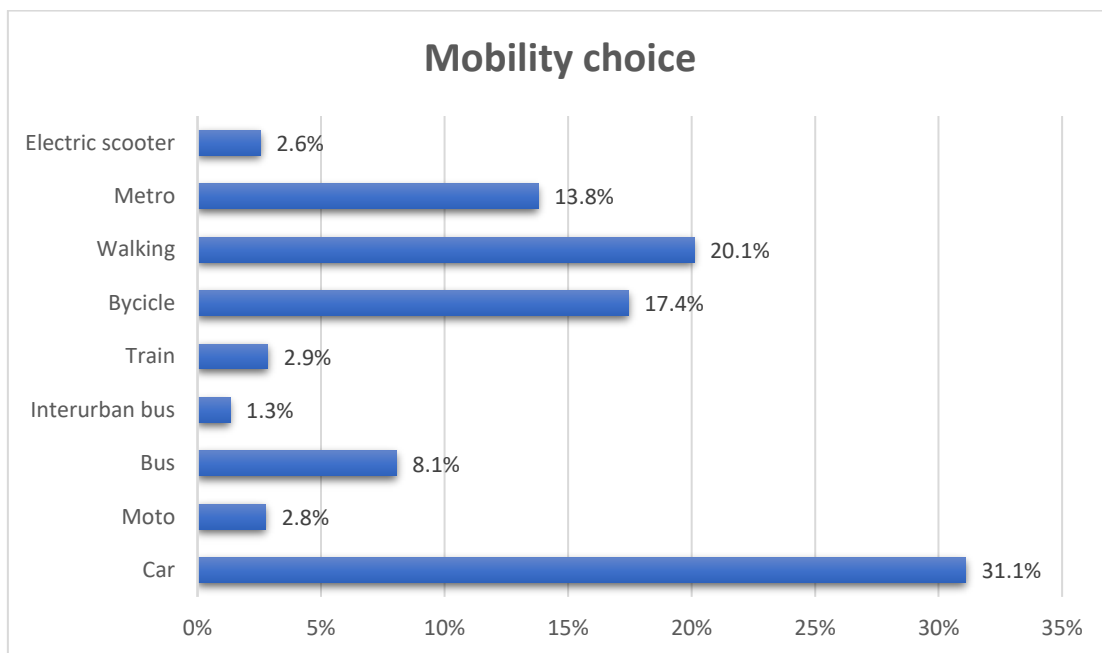


Figure 18. UPV students and young workers mobility choice in 2022. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

In Figure 18 we can find how many people is commuting by each different way of transport. Again, it is hard to see that most of the students and young workers commute by car. Even if we sum the percentage of every public transport the result would be lower than the students who commute by car. However, we must understand that many of these students may come from different cities and for some cases cars are the unique way of transport. Suburbs and close villages sometimes have deficient public transportation services and that’s one of the most interesting target carpooling services have.

Here below there is a column chart that shows how many students and young workers commute by carpooling from the 31.1% of the population that use car as a way of transport.

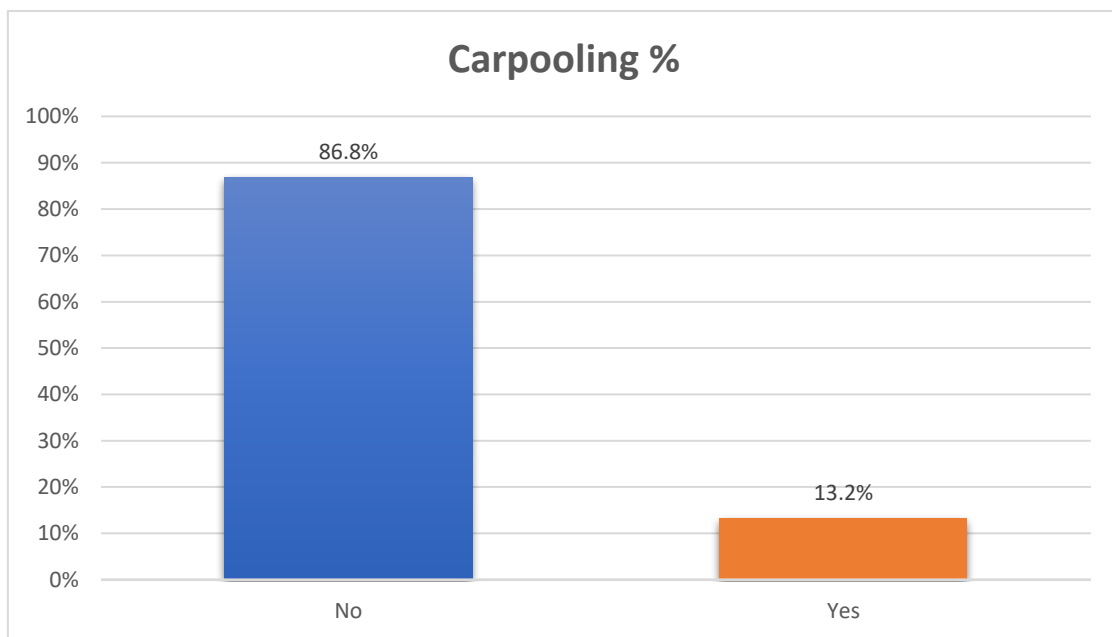


Figure 19. Carpooling users in 2022. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

According to Figure 19, 86,8% of the students and young workers that come by car are not sharing the car. The percentage is impressively high and reveals how far carpooling is from being one of the common ways of transport for daily mobility for young people.

The following chart takes the non-carpooling population from above chart and shows the different motives students and young workers have to not carpooling.

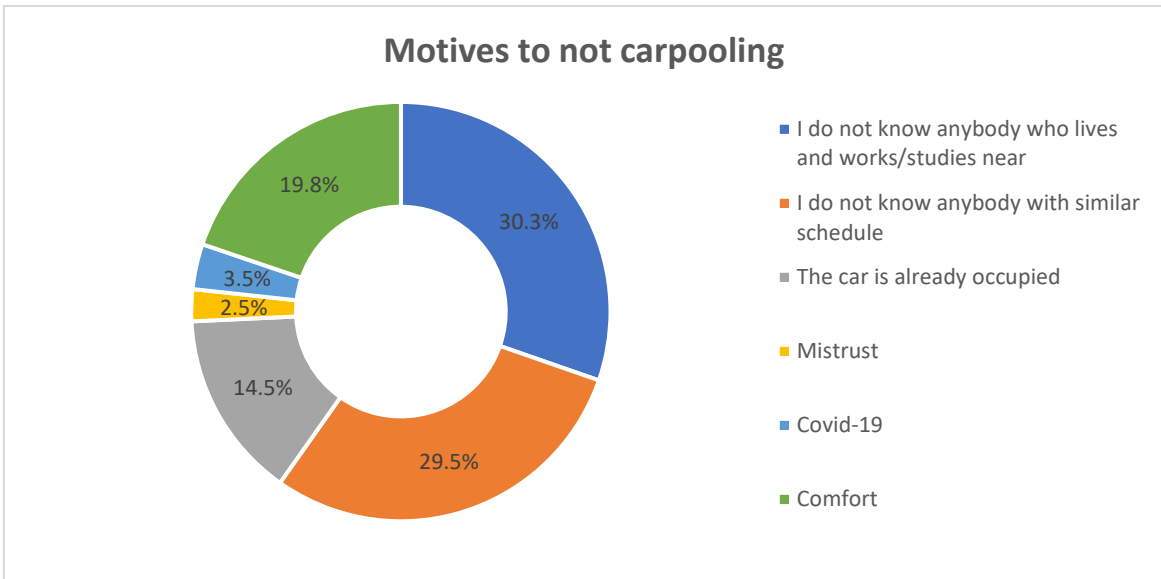


Figure 20. UPV students and young workers motives to not carpool in 2022. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

Regarding the data showed in Figure 20, we can realize that the main motives for students and young workers to not carpool are again related to timetables and place. Moreover, these motives means that there still are difficulties to find people with similar interests in terms of transportation despite we are in the internet era where we can easily know, communicate, and share data with anyone, from anywhere at any time.

Figure 21 shows the cars occupancy level in 2022. It gives us a big picture about how students and young workers are using their cars to commute therefore we can find out whether they drive alone or sharing.

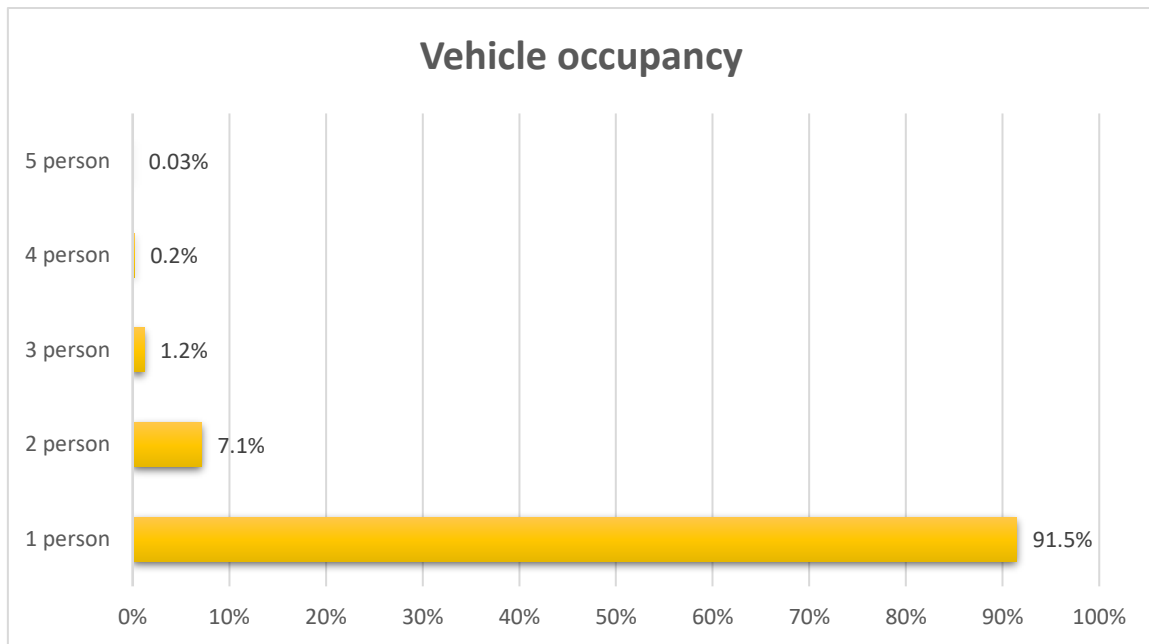


Figure 21. Students and young workers vehicle occupancy in 2022. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

According to the data, 91% of the students that commute by car are driving alone, which is a remarkable data. Very few students and young workers are sharing their cars while commuting, furthermore, almost none one is fulling the car. As a result, we can agree that the way people are using their cars is far from being efficient in terms of pollution and economical. Nevertheless, even though the 91% of the drivers are not carpooling the percentage of drivers predisposed to carpool is much bigger. The following column chart belong to a population who is not commuting by carpooling and compares the percentage of people who are willing to carpool against the people who are not.

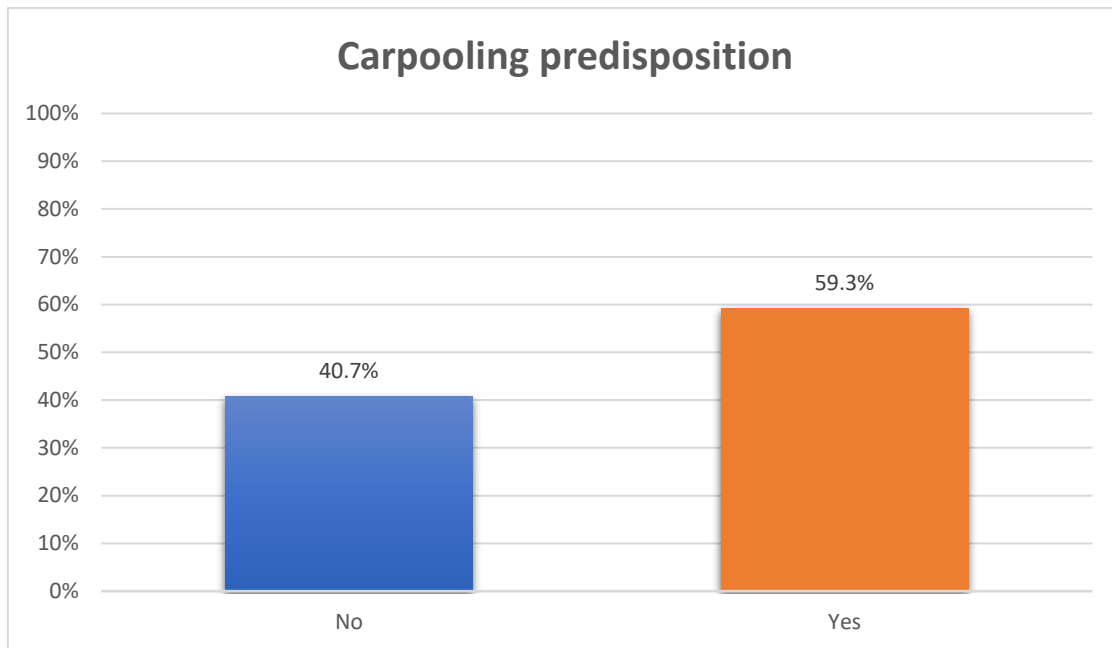


Figure 22. UPV students and young workers willing to commute by carpooling in 2022. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). *Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.*

Regarding Figure 22, almost 60% of the survey population are willing to commute by carpooling, which means that more than a half of the students and young workers consider carpooling convenient to their daily mobility choice while 40% of them are not interested or don't believe carpooling may be a good option for them. Giving this data it is crucial to understand why 60% of the population is willing to commute by carpooling but just 13.2% is doing it. And why the 40% of the population consider that carpooling is not a convenient option for them.

Next chart reflects the reasons why students and young workers would commute by carpooling. The population of this data came from the people who is willing to carpooling in Figure 22.

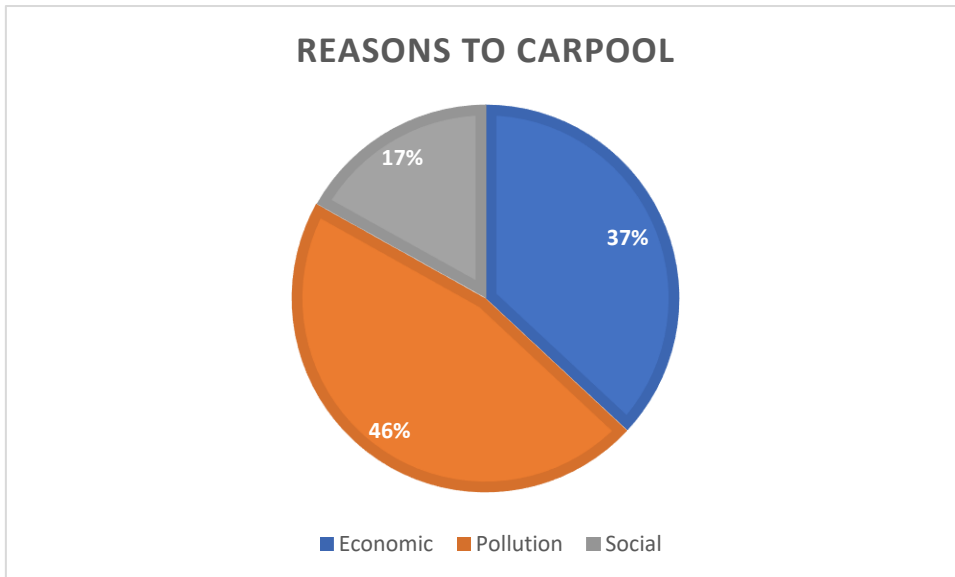


Figure 23. Reasons why students and young workers would commute by carpooling. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

Almost a half of the answers would commute by carpooling to reduce pollution and CO2 emissions while 37% answered economy. Both answers indicate that there is a difference of priorities between students who recognize global warming as a main concern and students who find economy as their principal reason for taking decisions. Hence, the data suggest that population is almost divided by people who prioritize climate change and people who prioritize self-economy. Moreover, there is also a small but still representative 17% of answers that recognize socializing as their reason to start commuting by carpooling which means that almost 1/5 students give value to know people, talk while commuting, and make relationships.

Figure 24 shows up how much time drivers are willing to spend in order to pick up a passenger.

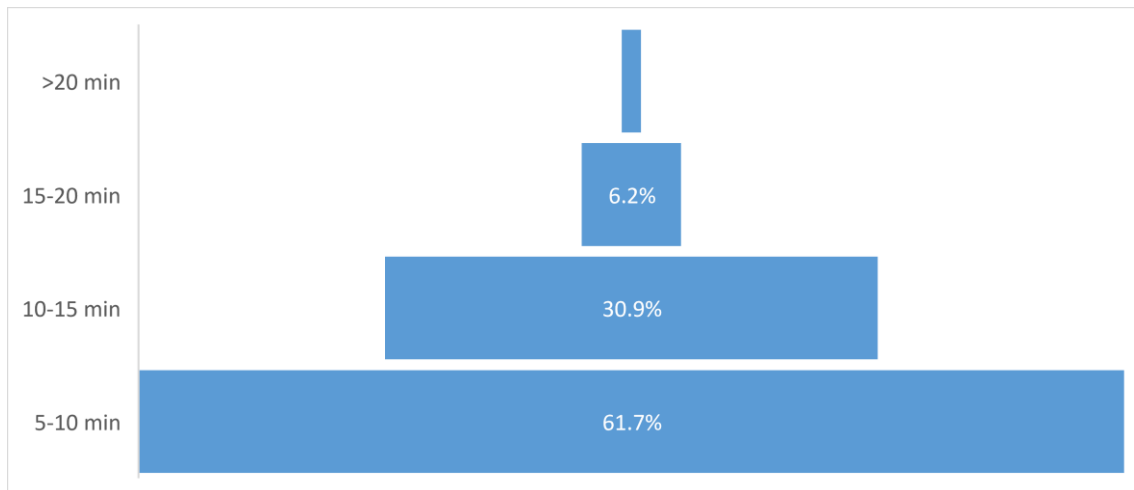


Figure 24. Drivers' disposal to delay time for picking up passengers. Source: Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

It shows how much time students and young workers drivers are disposed to spend on picking up passengers because of carpooling. More than 60% of the drivers who are willing to carpooling would spend less than 10 minutes, and more than 90% would not carpooling if that implies a delay of more than 15 minutes while just 1.2% of the drivers are willing to spend more than 20 minutes. This data reflects the value of the time from the point of view of drivers who most of them are willing to spend a few minutes in exchange of split costs, socialize and reduce pollution and traffic jams, but according to the chart these benefits have no more value than 20 minutes student's time.

At this point new research is needed in order to understand the reasons why people are not using carpooling as a mobility choice although they are predisposed, and which are the reasons why some population finds no value on carpooling as daily transportation.

6.2.3 Comparing both datasets.

Comparing data surveys from 2015 and 2022 we get a good picture about how students' mobility has change during the past 7 years. The following charts contains data from both studies in order to analyse the evolution and trends of commuting mobility in the Universitat Politècnica de València.

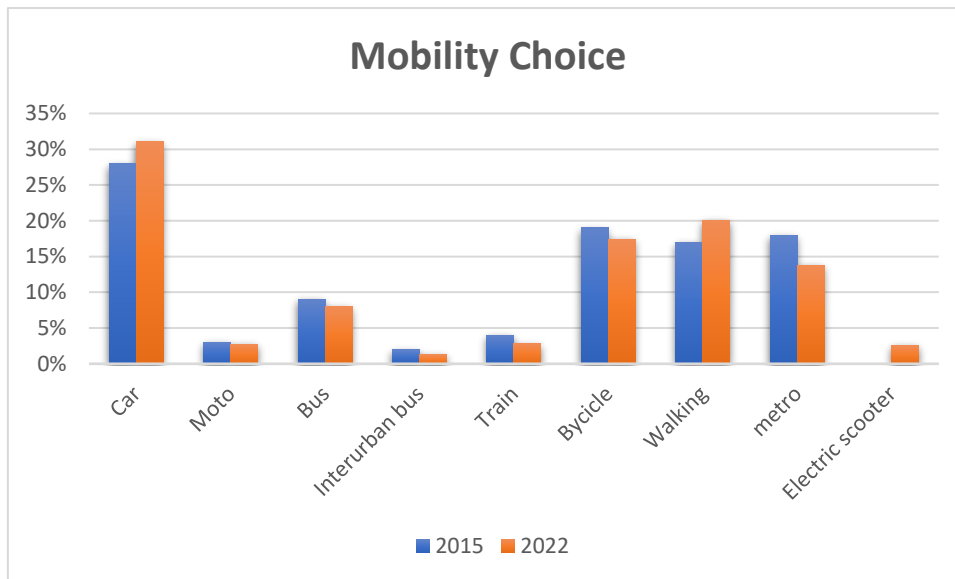


Figure 25. UPV students and young workers mobility in 2015 and 2022. Sources: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València & Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

In a general view, Figure 25 shows no significant changes during the past 7 years. Surprisingly the percentage of car users has increased instead of being reduced, and the percentage of use of public transportation such as bus, train and metro has decreased as well. On the contrary, walking percentage has increased and a new way of mobility has appeared, the electric scooter. Summarizing even though public transportation has been improved from the past 7 years the percentage of student's users has been reduced. Hence global warming and pollution concerns are not making students change their choices of mobility for commuting to university.

Figure 26 shows the car occupancy comparison in students' cars between 2015 and 2022. It gives us an approach about how carpooling has evolved in the past 7 years and how many people are willing to commute by it instead of driving alone.

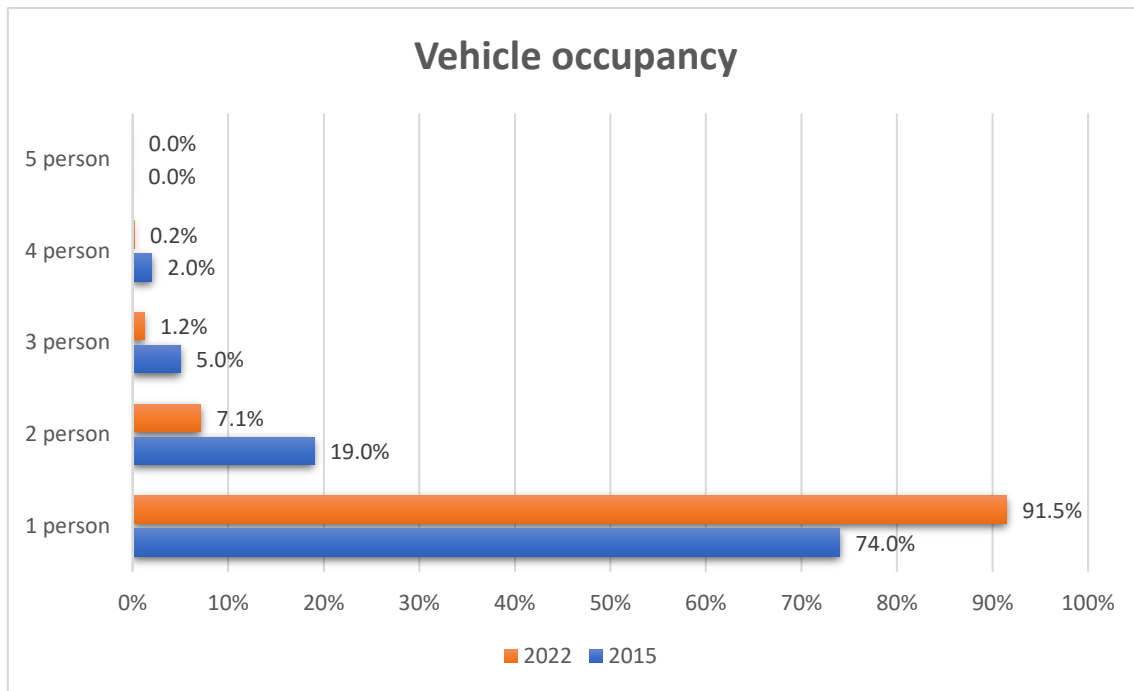


Figure 26. Vehicle occupancy in students and young workers cars in 2015 and 2022. Sources: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València & Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

This figure reveals a big decrease in carpooling in the past 7 years. Surprisingly, in 2022 there are 17% more of people who drives alone and much less people who are sharing their cars. Even though there has been a big improvement in the sense of smartphone applications and connectivity the chart shows up a huge decrease of carpooling, and an increasement of people who drives alone. Moreover, in 2022 91% of the cars just transported 1 person, therefore we must recognise the fact that drivers are giving a lot of value to comfort, they are not too concerned about reducing Co2 emissions, and traffic jams are not really a trouble or at least not enough to leave the car and look for another transportation service. On the contrary, people perceive driving alone as a worth and valuable mobility choice.

In terms of carpooling percentages, the gap from 2015 to 2022 is a little bit smaller, but still represents a non-expected decrease. Below chart displays the decrease of carpooling from 2015 to 2022.

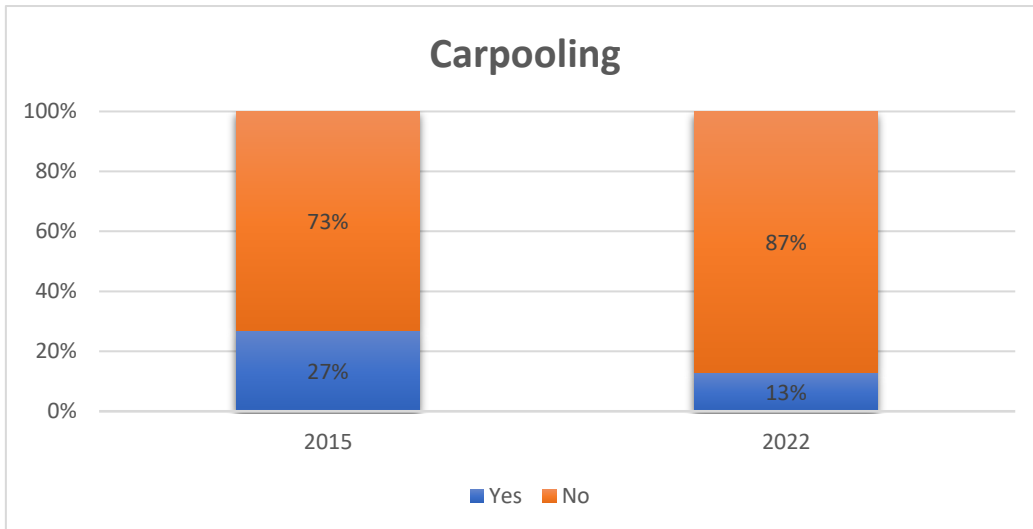


Figure 27. Percentage of people who commute by carpooling in 2015 and 2022. Sources: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València & Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

Figure 27 represents the percentage of people who commute by carpooling from the population that commute by car. Remarkably there is a decrease of carpooling although oil prices are rising, and information technology has grown and improved. Covid-19 is one of the reasons why people are giving value to drive alone instead of sharing the car, especially for the cases when you share a car with someone you don't know. Therefore, we must recognize that 2022 survey is affected by the pandemic and we can ensure that we would have very different results if the virus had never sparked.

The willingness to carpool of 2022 students is also affected by the pandemic. However, the data showed up in below chart reflect a very low percentage of people interested in sharing transportation.

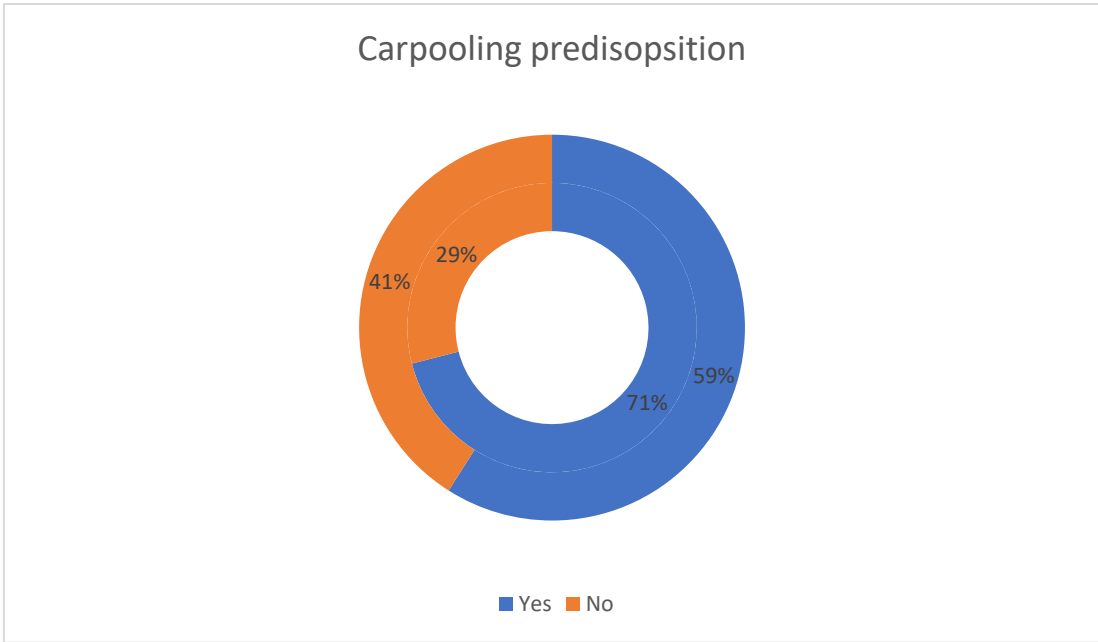


Figure 28. UPV students and young workers willingness to commute by carpooling in 2015 and 2022. Sources: Encuesta de movilidad de la UPV (2015). Diagnóstico de la situación actual. Unitat de Medi Ambient. Universitat Politècnica de València & Encuesta de movilidad sostenible a la comunidad universitaria de la UPV (2022). Diagnóstico de la Movilidad Sostenible de la UPV. Unitat de Medi Ambient. Universitat Politècnica de València.

The smaller circle of Figure 28 regards 2015 data while the big circle sees 2022 data. The willingness has decreased from 71% to 59% which means that there is lower interest and students perceive lower value than 7 years before.

7. Proposals

Considering above information, we realize that current service is not being efficient especially since is quite difficult to find people to match schedules and locations as we see in figure 19. Moreover, passengers are more likely to commute by carpooling than drivers, therefore there is a considerable lack of drivers compared to the passengers who are willing to carpooling (Santos, 2018). Hence, in order to improve carpooling services is absolutely necessary to implement strong marketing campaigns that allow companies to reach a vast target of users to facilitate ride matches. Otherwise, carpooling will not provide enough confidence to users, especially as a daily mobility service. From the point of view of business strategy carpooling is far from being a realistic option on daily mobility, therefore companies may understand that young people are attracted by socializing, reducing pollution and costs, but even though they give value to these benefits they mainly prioritize comfort and time, briefing, the transportation needs and preferences for young people are strongly related to time and comfort. Therefore, carpooling as a daily mobility will not be a reliable mobility choice until the service provides enough matches without changing users' routes or schedules.

On the other hand, drivers are not perceiving carpooling as beneficial as passengers are doing, and it is reasonable to understand that they are risking more than passengers. Therefore, it is realistic to say that higher incentives would attract more drivers and would be fairer for them (Hsieh, 2020). Reducing the gap between number of drivers and passengers that use carpooling would be also beneficial for the ride matching. Summarizing, the barriers that are stopping carpooling to be a consistent mobility choice for young people demand are directly connected between each other: the fact that there are few matches flexibility and the lack of drivers. Regarding business strategy and performance carpooling still is a non-reliable transportation choice, especially for express situations, but as far as its possible to match two people with same schedule and route carpooling became considerably attractive for young people. Hence, the success of this services is strongly related to the options of finding a target with common destinations and timetables.

8. Conclusions and limitations

We can consider that the lack of carpooling participation in developed countries is generally related to the high levels of car ownership, the lack of trust in stranger drivers and the difficulties of coordinating daily mobility schedules with others. Nevertheless, some of these aspects are being counter by technology services such as real-time location, route optimization, and secure payment transactions. Therefore, to provide carpooling services properly in western countries companies need to set up in smart cities where governments are disposal to act as partners and provide any technological solution needed to reduce mistrust barriers.

Regarding young people demand carpooling is well recognised as a convenient solution for both reducing costs and pollution, but even though the students knew about its advantages the acceptance is too low. From 2015 to 2022 there has not been a positive evolution although considering covid as an unexpected event the situation levels of carpooling acceptance are too low, and it is because of two main causes: current students give too much value to comfort and carpooling has not settled properly for daily mobility. Because of this last cause most of the students who reject to carpooling is because there is not possibility to match passengers and drivers with the same needs, especially when drivers are not willing to exceed their travels more than 15 minutes because of carpooling. We must also consider that the population used as a source is biased due to the fact that the data came from a single university of Spain.

Carpooling companies create value facilitating the users and drivers' communication through a digital platform; therefore, companies must consider subsidizing both sides to improve matching interaction. Empowering interactions and transactions between buyers and suppliers of carpooling platforms will perform an intermediary role which thanks to technology is more economical and user-friendly than old transportation models. Summarizing, young people are a big target to reach, but in terms of daily mobility the service must reach as many people as possible to be able to create proper matches and make the service as comfortable as any other mobility choice. The most difficult challenge companies must deal with is to make the service comfortable for both customers and drivers and enable them to travel secure, easy, and with accurate information.

9. References

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