Lisbon School of Economics & Management
Universidade de Lisboa

MASTER

MANAGEMENT AND INDUSTRIAL STRATEGY

MASTER'S FINAL WORK

DISSERTATION

CHALLENGES, BARRIERS AND INTERVENTIONS FOR ENCOURAGING GREATER USE OF PUBLIC TRANSPORT IN PORTUGAL

MIGUEL RITA LUZ JESUS

OCTOBER – 2024

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SUPERVISION:

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Abstract

Public transport is crucial towards the decarbonization of the transportation industry and, usually, the most suitable substitute of private transport. Despite this, in Portugal, public transport is considered as a backup option and only a low percentage of the population takes advantage of the service daily.

Therefore, this study aimed to identify and understand which are the main challenges and barriers to overcome on this regard and propose interventions to help mitigate the problems and, simultaneously, foment the use of public transport. To achieve this objective, 16 semi-structured interviews were conducted with a range of experts in public transport that occupy roles in different economic activities in Portugal.

The insights obtained indicate the necessity for: (i) the reconfiguration of public space and mobility; (ii) service quality improvement; (iii) public transport network integration and (iv) a change in users' mentalities. To tackle such challenges, several interventions are proposed to increase the attractiveness of the service and alter the historical negative perception that users have of public transport.

Furthermore, this study emphasizes the urge for decision makers to act in coherence towards the encouragement and promotion of a more sustainable mobility and a socially responsible behaviour.

Keywords: Public Transport; Sustainable Mobility; Mobility Solutions; User Behaviour; Transport Knowledge; Urban and Rural Transport

Resumo

O transporte público é crucial para a descarbonização da indústria dos transportes e, frequentemente, a alternativa mais adequada ao transporte privado. Apesar disso, em Portugal, o transporte público é considerado uma opção de reserva, e apenas uma baixa percentagem da população utiliza este serviço diariamente.

Consequentemente, este estudo visou identificar e compreender quais os principais desafios e barreiras a superar neste contexto e propor intervenções para ajudar a mitigar os problemas e, simultaneamente, fomentar o uso do transporte público. Para atingir este objetivo, foram realizadas 16 entrevistas semiestruturadas a um conjunto de especialistas em transportes públicos que ocupam cargos em diferentes atividades económicas em Portugal.

Os resultados obtidos indicam a necessidade de: (i) reconfiguração do espaço público e da mobilidade; (ii) melhoria da qualidade do serviço; (iii) integração da rede de transporte público; (iv) mudança nas mentalidades dos utilizadores. Para enfrentar estes desafios, são propostas várias intervenções, visando aumentar a atratividade do serviço e alterar a perceção historicamente negativa que os utilizadores têm do transporte público.

Adicionalmente, este estudo enfatiza a urgência de atuação coerente dos responsáveis, no sentido de encorajar e promover uma mobilidade mais sustentável e um comportamento socialmente responsável.

Palavras-chave: Transporte Público; Mobilidade Sustentável; Soluções de Mobilidade; Comportamento do Utilizador; Conhecimento sobre Transportes; Transporte Urbano e Rural

Glossary

AI – Artificial Intelligence

AML – Área Metropolitana de Lisboa (Lisbon Metropolitan Area)

AMP – Área Metropolitana do Porto (Porto Metropolitan Area)

AMT – Autoridade da Mobilidade e dos Transportes (Mobility and Transport Authority)

EEA – European Environment Agency

EMTA – European Metropolitan Transport Authorities

IEA – International Energy Agency

IMT – Instituto da Mobilidade e dos Transportes (Mobility and Transport Institute)

INE – Instituto Nacional de Estatística (National Statistics Institute)

IRENA – International Renewable Energy Agency

PART – Programa de Apoio à Redução Tarifária nos Transportes Públicos (Tariff Reduction Support Program)

TML – Transportes Metropolitanos de Lisboa (Lisbon Metropolitan Transports)

TPB – Theory of Planned Behaviour

WTCC – World Travel & Tourism Council

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1. Introduction

In the European Union, regarding land passenger transport, Portugal is the second country where the car is most used, only behind Lithuania. The country is above the European average on car use and below the average ridership on any mode of public transport (European Commission, 2023). In Portugal, public transport represents around 16% of all passengers transported (INE, 2024), while in countries like Austria and Hungary, that number can reach between 25% and 30% (European Commission, 2021).

In Portugal, from 2019 to 2022, less than 5 million euros were invested into improving land public transport offer from a total investment of 684 million euros, mainly used to keep essential services running (Luz, 2023). This lack of investment partially explains why, in 2022, 61% of people in Lisbon's and Porto's metropolitan areas (Portugal's two largest cities) manifested a better functioning of public transport as the main solution for reducing car usage (Vasconcelos, 2023).

Since a low rate of utilization of public transport is negatively correlated with a high utilization of private transport (Collins & Chambers, 2005), society urges for decisive actions that support the shift towards public transport. In terms of mobility, for most people, public transport is the most viable alternative to the car and is referred as the key element to deal with some of the (private) transport consequences such as traffic congestion and air pollution levels (Ngoc et al., 2017). Thus, if more people commuted via public transportation, fuel consumption and CO2 emissions could be considerably decreased (Bamberg et al., 2007).

Public transport also guarantees affordable, accessible and fair mobility (European Commission, n.d.), driving equity, playing an essential role in combating structural inequalities and improving, mainly for those more misfortunate, the chance to access opportunities for further economic and social development (Guzman & Oviedo, 2018).

There is an urgent need of alignment with user expectations on transport since a general behavioural change can be a determinant to redesign future urban mobility (Kellar et al., 2023). Despite existing potential for a modal shift from personal private transport to collective public transport (IRENA, 2022), consumer behaviour is a complex decision process that is influenced by various factors, with the choice of mode of transport put to the test by a significant number of barriers (Chowdhury & Ceder, 2016) and challenges.

Ultimately, public policy should improve based on the needs of its users (Şimşekoğlu et al., 2015), after understanding their travel behaviour and expectations (Ramos et al., 2019) with the ultimate target of offering a variety of options (bus, train, metro, tram) that optimizes benefits and minimizes costs (Redman et al., 2013).

1.1 Objectives, Problem and Research Questions

Given the reality above, this study aims to answer the following research question: "What are the challenges and barriers that public transportation currently faces?". The main objective of the study is to identify the challenges and consequent barriers for public transport to provide a meaningful framework that clarifies the obstacles it encounters. Additionally, the study intends to present interventions to foment public transport use and a more responsible and sustainable user behaviour.

So, the development of this study is made with the determination to understand what are the challenges that need to be addressed, identify their respective barriers and put forward suggestions to overcome them, as well as serve as a guide on how to stimulate the usage of public transportation. It is also about underlining the need to propel sustainable mobility, knowing that this is a key area to achieve the European Union 2030 Agenda for Sustainable Development and its 2050 carbon-neutral objective.

1.2 Contributions and Relevance of the Study

This study, in contrast to previous literature, is focused on making good use of the experience and knowledge of experts across the transportation industry to propose ways forward to encourage the use of public transportation. Also is becoming increasingly important to explore why people struggle to adopt public transport (Pedersen et al., 2012) since the negative effects of private transport are prevailing and causing apprehension regarding the future of mobility.

Understanding the barriers that influence public transportation usage behaviour can provide important implications for transport policies (Fu & Juan, 2017) and facilitate government intervention to mitigate perceived problems (Cheng & Chen, 2015). This way, working alongside key stakeholders, it becomes possible to bridge the gaps that currently exist in public transportation (Bezyak et al., 2019), improve ridership, reduce inaccurate perceptions and emphasise the normality of public transport use (Murray et al., 2010).

1.3 Dissertation Structure

The current dissertation is divided into five chapters: (1) introduction; (2) literature review; (3) methodology; (4) findings and discussion; (5) conclusion.

The introductory chapter presents the context, benefits and importance of public transport usage. Besides focusing on introducing the reality surrounding the topic, it also explains the investigation objectives and relevance. The second chapter presents a theoretical review of the concepts explored in the dissertation, starting with the transport sector and narrowing it down to public transport, where the barriers to its usage are analysed and explained. In the methodology chapter, the research method is clarified, detailing aspects regarding the technique used in the gathering and treatment of the data collected. In the fourth chapter, findings are analysed and then interpreted to explore the different possibilities towards fomenting public transport use. With all the information gathered, in the last chapter, all that is left is to withdraw conclusions, discuss the contributions of the study and present the limitations and suggestions for future research.

2. Literature Review

2.1 Transportation Industry

Transport or transportation in its core is the movement of anyone or anything from one place to another, "fulfilling mobility needs that result from activities such as living and working and from the consumption, trade and production of goods and services" (EEA, 2022). This means that transportation is present in most of our lives, linking the world together, and unlocking countless possibilities by allowing people from not being restrained to a single geographic location. For these reasons, transportation has been referred to as one of the four cornerstones of globalization (Kherbash & Mocan, 2005).

Studies have shown that globalization pushes developing countries in the direction of diminishing sustainability (Borghesi & Vercelli, 2002), increasing their carbon emissions and hurting their long-term environmental health (Shahbaz et al., 2016). By facilitating a rapid and efficient movement of people and goods within and across borders, transportation has created severe sustainability issues (Miller et al., 2016), mainly environmental. It is one of the most pollutant industries and its global CO2 emissions not only grew, in 2022, (IEA, 2023) as well as are expected to continue an ascending trajectory, if additional measures are not implemented (EEA, 2023).

Although sustainability topics are becoming increasingly alarming, it cannot be minimized that transportation is one of the most important industries in the world, playing a vital role in society and being responsible for great economic development (Lin & Xie, 2014). Despite facing challenges in terms of suitable technology and energy resources (Dominković et al., 2018), countries are opting for the responsible development of their transport systems in a way that minimizes the aggravation of problems such as climate change, global warming, carbon dioxide emissions, etc (Lin & Xie, 2014).

In 2022, private cars accounted for 45 per cent of global transport (McKinsey, 2023). This means that nearly half of the transportation industry emissions come from private vehicles on land. Part of these vehicles can be substituted for other suitable options, such as public transportation, which results in a need for fewer cars for transport (Gershon, 2005).

As an alternative mode to private vehicles, public transportation, which "refers to travel by bus, coach, tram, metro and rail" (EEA, 2022), must, in order to be attractive,

meet customer demand by satisfying capacity needs, while maintaining its status as an accessible, affordable, fast and reliable mode of transport (Ngoc et al., 2017). Public transport is considered to be necessary and more appropriate for mobility, especially in large cities (Kwan & Hashim, 2016) where the viability of urban communities often depends on effective and affordable public transport (Gershon, 2005). Public transport is also generally recognized as a ‘‘green” transport mode due to its larger capacity (Fu & Juan, 2017). Environmental experts have estimated that fuel consumption, CO2 emissions, and air pollution levels could be considerably decreased if more people commuted via public transportation (Bamberg et al., 2007). Furthermore, it would limit the adverse effects of traffic congestion (Ngoc et al., 2017), vehicle dependency (Lee et al., 2016) and human health deterioration (Miller et al., 2016). Thus, the idea of sustainable development is commonly connected to the use of public transportation (Miller et al., 2016) and can only be achieved if it exists simultaneously economic growth, social inclusion and environmental protection (United Nations, 2018). Public transport is a service considered to be aligned with these spheres since it contributes to the development of environmentally, socially and economically sustainable communities (van Lierop et al., 2017).

Furthermore, a lack of access to transportation can hinder one’s economic and social development, creating imbalances that can lead to breaches of fundamental civil rights (Lee et al., 2016). On the other hand, public transportation enhances inclusion and community participation, offering people who struggle (elderly, disabled, young adults, economically disadvantaged individuals, etc), their only option in terms of mobility (Gershon, 2005) and the chance to live a meaningful and enjoyable life (Bezyak et al., 2019). But, so far, the selection of transport projects seems to favour people with higher incomes, instead of providing meaningful changes for those who are not able to access private vehicles (Di Commo & Shiftan, 2017; Ngoc et al., 2017), exposing the severe sustainable development issues that transportation faces (Redman et al., 2013). Public transportation can also bolster the economic viability of a city or a country, with many tourists or visitors opting for the utilization of such transport (Gershon, 2005), specifically in countries where tourism is key for the economy. Consequently, Portugal has a lot to gain from it, since in 2023, the sector of travel and tourism contributed with 52 billion euros, reaching almost 20% of the country’s gross domestic product (WTTC, 2024).

Seeing that every benefit of public transportation is optimized by high utilization rates (Gershon, 2005), which, as seen prior, Portugal does not benefit from, there is a clear need for a better understanding of users' behaviour to unlock the existing potential for a change of preferences from private passenger cars use to collective public transport (IRENA, 2022). Comprehending the motivations, perceptions and contexts that affect users' behaviour can be crucial for transport mode choice (Göransson & Andersson, 2023). Therefore, it is important to clarify the reality of Portuguese public transport users since it is not the same for everyone.

2.2 Portuguese Demographic Context

Since the 90's decade, in Portugal, the increase in private transport and the extension of land infrastructures lead to the delocalization of productive activity, with people expanding their home-work radius since mobility became more practical and convenient. Consequently, this changed mobility patterns, the configuration of urban spaces and the development of metropolitan areas (Santos, 2015). Contrariwise, the rural exodus left, especially the interior of Portugal, more depopulated, older and poorer (Lusa, 2019), remaining nowadays a country with accentuated regional disparities between the metropolitan and the interior and more rural areas. Most of these areas, predominant in the north and centre of the country, do not exceed 50 inhabitants/km^2. On the other hand, the metropolitan areas of Lisbon and Porto (Portugal's largest cities) exceed 1,000 inhabitants/km^2 due to their greater attractiveness and service development (European Commission, n.d.).

Lisbon's metropolitan area is constituted of 18 counties, divided into two main regions: Grande Lisboa (AML North) and Península de Setúbal (AML South). It covers a total of 3.002 km^2, has 2.821.876 inhabitants (AML, 2023) and it benefits from four different modes of public transport: bus, metro, rail and boat. Despite these alternative options, private cars account for 60% of all trips in Lisbon's metropolitan area, a reason for it to be one of the cities with the most traffic in the world (Rito, 2019) and the second most stressful European city to drive (SIC Notícias, 2024). In similar fashion, Porto's metropolitan area encompasses 17 counties from the Northen region of Portugal, covering 2.040 km^2 and being the home of another 1.700.000 inhabitants (AMP, n.d.).

Considering that Portugal has around 10.600.000 inhabitants (INE, 2024), this means that more than 40% of the population resides in these two metropolitan areas, while the

rest is distributed in intermediate (villages, suburbs) and rural areas (Laranjeiro, 2015). Therefore, there is not only a necessity of understanding the challenges of public transport in areas where there is a considerable supply, but also in places where a large part of the population suffers to access to public transport. Only by analysing both realities will it be possible to gain a deeper perception on the conditions needed to maintain a reliable and sustainable public transport service and to minimize the barriers that can hinder it.

2.3 Barriers to the Use of Public Transport

2.3.1 Definition of Barriers

A "barrier" is defined as something that prevents something else from happening or makes it more difficult (Cambridge Dictionary, n.d.). For public transport, a barrier is hence something (a factor) that prevents or discourages people from using it. If an increase in the quality of the public transport service enhances the possibility of attracting users (Redman et al., 2013), the existence of barriers will only harm users' perceptions and diminish utilization rates.

In the academic literature, despite the existence of clear identification and awareness towards the biggest barriers in public transportation, there are different suggestions towards the categorization of such barriers. Blainey et al., (2012), in their research, categorize barriers as hard, soft or complementary barriers. Hard barriers are classified as those that have an equal effect on all users in a particular flow and, consequently, can be measured straightforwardly. Soft barriers are specific for each user since it is possible to have different perceptions and/or attribute a different importance to some of the factors of the public transport experience. Complementary barriers relate to the impact that users' lives, background, culture and political and economic factors have on people's choice of transport.

Other authors such as Redman et al. (2013), Fu and Juan (2017), Zailani et al. (2016), Chowdhury and Ceder (2016) and Collins and Chambers (2005) focused their research on understanding the psychological factors that affect or predict the intention to use public transport. Redman et al., (2013) divides public transport attributes into physical or perceived, characterizing them one way or the other, depending on the need to consider public transport users' personal opinions and experiences. If an attribute, in the context of the study, is presented as a quality that public transport has, the lack of that same attribute can be theorised as a barrier.

In this study, we propose a new characterization of barriers (Table I), complementing on the one used by Blainey et al., (2012), to also address the influence of intrinsic and extrinsic factors in the users' behaviour towards public transport. Intrinsic factors represent the internal factors (Chaudhary, 2018) since they are a matter of the individual alone (Denby, 2006) and a reflection of one's interests, values (Lee & Pounders, 2018), motivations and needs (Bagga & Bhatt, 2013). In addition, extrinsic factors can also influence individual behaviour (Chaudhary, 2018). They relate to the external side because the user can only react to them instead of being "in control" of things.

Table I. Typologies of Barriers

	Soft	Hard	Complementary
Intrinsic	Discomfort Perceived frequency Perceived Safety Lack of Control Negative Attitudes Past behaviour Personal norm Lack of Environmental concern	Not applicable	Strong car use habit Age and gender
Extrinsic	Not applicable	Overcrowding Lack of available information Lack of Frequency Poor Reliability High Cost Network limitations Low Safety	Weather and Climate Economic abundance and inequality Subjective norm

Therefore, barriers to public transport usage are categorized as intrinsic or extrinsic depending on its nature and hard, soft or complementary depending on its type. Soft barriers are the ones that are subjective in interpretation since they can depend on users' personal experiences/perceptions and can vary according to the specific environment of a particular trip in a certain mode of public transport. Contrarily, hard barriers are objective, straightforward in their measurement and do not depend on an individual's perspective. At last, complementary barriers relate to external factors, the ones that are not directly associated with transportation qualities or flaws but still can influence the public transport experience.

For example, lack of frequency is considered to be a hard barrier since it is possible to measure if there is a high or low frequency of a certain type of public transport by analysing the number of trips that it does daily and does not the depend on users' perceptions and views. On the other hand, discomfort cannot be measured by counting or analysing data. Instead, it depends on each user's view given that two people on the exact same trip can experience different levels of discomfort.

2.3.2 Type of Barriers to the Use of Public Transport

Soft barriers.

Several factors can determine the willingness and intention to adopt a certain behaviour. The Theory of Planned Behaviour (Ajzen, 1991) underlines three independent constructs of intention: subjective norms, attitudes, and perceived behaviour control. Regarding transportation, among the three TPB variables, *subjective norm*, that is the *social pressure* applied to engage in a particular behaviour (Zailani et al., 2016), is the most influential factor in influencing switching intentions towards public transport (Chen & Chao, 2011). Social pressure refers to the expectations and opinions of people who are close (friends and family) to display or avoid specific behaviours (Fu & Juan, 2017).

Likewise, *personal norm*, that is described as the individual's conviction that his actions are right or wrong (Bamberg et al., 2007), and *past behaviour* (Zailani et al., 2016) are also found to be factors that contribute to public transport use intention, assuming a repetition of behaviour according to one's conviction and past experiences.

The *individual's attitude* towards multiple aspects of public transportation is also a barrier to the use of public transportation (Beirão & Cabral, 2007). Changing user's attitudes is critical to overcoming the negative perceptions and images that still exist towards public transport (Beirão & Cabral, 2007), like the preconceived idea of associating the car to a status symbol (Golob & Hensher, 1998). Even if there is an improvement in service quality, that can pass unseen if travellers hold strong prejudices towards public transport and its users (Murray et al., 2010). However, despite being a significant predictor of the intention to use public transport (Şimşekoğlu et al., 2015; Zailani et al., 2016), attitudes, when negative, are very complicated to change. Negative attitudes can be strongly held and defended if someone's beliefs or behaviour is challenged persistently and incorrectly (Beale & Bonsall, 2007) creating an even bigger barrier for a possible attitude change. Thus, correcting key misperceptions through

persuasive messages can be one way of attenuating the attitude barrier (Beale & Bonsall, 2007) and, at the same time, contribute to the improvement of the overall public transport image (Beirão & Cabral, 2007), emphasizing the "normality" of public transport use (Murray et al., 2010).

When investigating the various attitude factors that impact travel behaviour, Nilsson and Kuller (2000), found that *environmental concern*, *use habits, and car affection* were the most important ones. In what relates to environmental concern, people also showed a greater interest in using public transport due to environmental awareness and pro-environmental attitude (Murray et al., 2010) in heavy traffic areas (Nilson & Kuller, 2000), when included in a society that is aware of the negative environmental consequences caused by private transport and when feelings of guilt come into play to change behaviour due to an awareness of the environmental damage of using private cars (Bamberg et al., 2007). Therefore, the *lack of environmental awareness, environmental concern and pro-environmental attitudes* among individuals may constitute a barrier to the adoption of more sustainable options such as public transport.

Although a social dilemma involving the sacrifice of car use and its "visible" benefits for some "invisible" environmental gains (Nordlund & Garvill, 2003) is often manifested by users, this social dilemma in individuals that lack environmental concern is usually insufficient to change behaviour towards using public transport (Beirão & Cabral, 2007).

Another barrier to public transport use is the strong *habit* of car use that hinders users' intentions to use other ways of transportation (Chen & Chao, 2011; Chowdhury & Ceder, 2016; Şimşekoğlu et al., 2015). The development of habit happens through frequent usage in a stable context (Chen & Chao, 2011), to an extent where the method of transportation is chosen automatically without deliberate thinking (Fu & Juan, 2017). While car users can consider a switch to public transport if they are experiencing problems such as congestion or a lack of parking (Blainey et al., 2012, as cited in Rye & McGuigan, 2001), at the same time, they associate public transport with barriers such as *difficulties in travelling with children*, *social status* and *busy work schedules* (Şimşekoğlu et al., 2015).

Public transport users also want a pleasant and comfortable journey (Beirão & Cabral, 2007), free from overcrowding, a significant cause of passenger dissatisfaction.

Crowding levels of public transport are related to feelings of discomfort by passengers when using public transport (Blainey et al., 2012).

Beyond crowding levels, comfort perception also includes priorities of safety and security, related to travel accidents, security issues and crime (Şimşekoğlu et al., 2015). If, on one side, the perception of safety is discussed as having a small influence on ridership (Delbosc & Currie, 2012), on the other, comfort, for regional public transport, is concluded to be more important than frequency (Göransson & Anderson, 2023).

Comfort can also relate to *always having available information*, improving the perceived *easiness of use* of public transportation. Contrarily, a perceived lack of information can have a negative effect on an individual's attitude towards public transit (Chen & Chao, 2011) and act as a barrier to public transport use since it can decrease the usefulness of public transport (Beirão & Cabral, 2007). At the same time, *none* or *low-quality information* can also lead travelers to stress and feel uncertain (Chowdhury & Ceder, 2016), "locking" them into car dependence if the information is consistently inaccurate (Blainey et al., 2012). Dziekan and Vermeulen (2006) investigated the effects of real-time information displays at tram stops in the Netherlands and found that they can reduce the perceived wait time, and the better the access to service information, the higher the *individuals' perceptions of being in control* (Gardner & Abraham, 2007).

Hard barriers.

One of the major disadvantages of public transport involves the *lack or poor frequency of the service* (Blainey et al., 2012). This increases *waiting times*, which are perceived as the longest part of commuting by public transport (Dziekan & Vermeulen, 2006). According to Göransson and Anderson (2023), any public transport with a low frequency, or that requires multiple transfers, fails to be attractive, especially when compared with private cars. Users have a preference for a direct frequent public transport service (Beirão & Cabral, 2007). Studies with the overall objective of evaluating public transport services support the idea with Cheng and Chen (2015) reporting in their study that a lack of frequent and delayed bus service was the most critical problem for passengers in Taiwan. Jou and Chen (2014) reach a similar conclusion, identifying a correlation between a higher daily frequency of buses and greater usage percentages of public transport. Thus, a lack of frequent departures can be a barrier towards public transport (Şimşekoğlu et al., 2015).

Reliability, which is usually linked with frequency, also plays a determinant in transport choice. Not only should the service be frequent but also reliable, by assuring that the expected journey times are attained daily, without significant and possible troubling delays (Blainey et al., 2012). Nevertheless, despite being considered by users as the most important factors in creating an attractive public transport supply (Redman et al., 2013), reliability and frequency are not enough to create a mode shift to public transportation (Göransson & Anderson, 2023).

Due to the sensitivity of the economy, *cost* is an important factor that weighs in on users' decisions. Cheap substitutes for cars are essential (Nilsson & Kuller, 2000) and, if public transport is one of those options, that can lead to a shift in the choice of mode of transport (Göransson & Andersson, 2023). On the other hand, previous works demonstrate that cost is more important towards preferences ratings then to effect or change actual behaviour (Collins & Chambers, 2005). Blainey et al. (2012) even assumes the possibility that cost is a barrier originated by a lack of simplicity regarding fares and the misconception of associating public transport cost as an additional expense, rather than a necessity.

According to data from 610 cities in 95 countries from all over the world, in 2019, only half of the world's urban population had convenient access to public transportation (United Nations, 2021), *limiting* those people to other *modes of transport*. Thus, n*etwork limitations* pose yet another barrier to public transport (Blainey et al., 2012) exposing users' needs for a service that covers sufficient ground, which is not always the case. According to Ingvardson and Nielsen (2018), a direct relationship between public transport coverage and ridership exists. Through a collection of data from 48 European cities, they were able to conclude that the smaller the extension and coverage of the metro and rail networks, the less frequent the use of public transport was. Jou and Chen (2014) concluded the same thing regarding bus use in Taiwan, with usage percentages of public transport being directly correlated with total city bus route lengths and coverage.

Complementary barriers.

Socio-economic characteristics also have a significant influence on ridership. Cities with larger equality have higher ridership (Ingvardson & Nielsen, 2018), and a *higher annual income per capita* and *higher Gross Domestic Product per capita* were also associated with higher car usage and lower usage percentages of public transportation

(Ingvardson & Nielsen, 2018; Jou & Chen, 2014). In terms of *age* and *gender* study results are inconclusive. Increased age, for example, was linked to less use of public transport in the study by Cheng and Chen (2015). But, in other studies, general demographic information (e.g. gender, ethnicity, age) was found to be unimportant (Murray et al., 2010) and did not have a direct influence on feelings of safety on public transport use (Delbosc & Currie, 2012).

For those who rely largely on public transport due to the lack of alternatives, *Weather* and *climate* is not a strong influential factor (Zhou et al., 2017). Nevertheless, it can cause discomfort and still play a role in discouraging users (Blainey et al., 2012), impacting both the performance of transportation systems and the travel behaviour of some passengers (Zhou et al., 2017).

To address all of these barriers, some suggestions have been recommended in an attempt to guide public policy into addressing the issues that are considered to be crucial for a change in mentality regarding public transport. These include raising awareness regarding the effects of car use and promoting environmental beliefs through education and advertising (Collins & Chambers, 2005), the promotion of more favourable attitudes and aspects (e.g. safety, cost) of public transport (Şimşekoğlu et al., 2015) and the improvement of its overall image (Beirão & Cabral, 2007).

In summary, factors that affect public transport use include the role of globalization in transportation and rising sustainable awareness and development while barriers encompass users' mindsets and the lack of convenience and comfort that currently exists in public transportation. The recommended interventions suggest a generic focus on challenging consumers attitudes, perceptions and image of public transport.

Although not all individuals are willing to change their modes of transportation, a percentage may feel constrained by their travel options. Our research acknowledges the necessity of tackling these constraints. Drawing on interviews conducted with a range of experts in public transport, we identify the challenges of what needs to be done and the associated barriers to doing it and propose potential interventions to help encourage more public transport use.

3. Methodology

Due to the complexity and depth of the topic, this study is qualitative, using a single collection of data to develop a theoretical contribution regarding public transport. Qualitative research is based on words and their interpretation (Saunders et al., 2019) and was proven to be effective in understanding people's attitudes and perceptions towards transport (Beirão & Cabral, 2007). Complementarily to the existing research conducted with users, this study intends to provide more complete insights by looking for new and more knowledgeable perspectives.

It also presents an exploratory nature since its usefulness comes from the will to clarify the understanding of a problem or phenomenon (Saunders et al., 2019) through the insights of experts in the area. Therefore, primary data was gathered through 16 semi-structured interviews, with the objective of enhancing the knowledge regarding public transportation, obtain different views on the topic and to validate, not only the current challenges that public transport faces but also its future growth possibilities. As mentioned above, semi-structured interviews were used since they allow for more flexible and fluid conversations (Kvale, 2011) and raise more detailed answers (Qu & Dumay, 2011). This allowed for interviewees to elaborate more on the different topics, so that points of interest emerged inductively.

The study's span encompasses academics, politicians, consultants and board-members from the principal transportation companies, that were selected through a heterogeneous purposive sampling approach, using own judgement to identify the participants that best fit the study. All the participants present a vast curriculum linked to the transportation industry and a broad set of diverse experiences, enlarged by the variety of roles assumed for many years now, therefore representing a large range of stakeholder's views and allowing for more detail since these are people who directly impact on how public transport is managed and perceived in Portugal. This diversity in the participants sample, can be an advantage since it adds validity and interest to any kind of similar opinions that appear (Patton, 2015). The characteristics of the participants are detailed in Table II.

Table II. Interviewees' Profiles

Interviewee Name	Occupation/Expertise
Carlos Teixeira	Former Member of the European Environmental Bureau Executive Commission and Vereador in Câmara Municipal de Lisboa
Alexandre Marvão	Planning and Management of Mobility and Transports for Setúbal City Counsel
Teresa Stanislau	Board Member at Sociedade Transportes Coletivos do Porto (SCTP)
Carlos Gaivoto	Head of Planning Department at Transportes de Lisboa | Former Director of Lisbon's Transports Metropolitan Authority
Filipe Moura	Head of Laboratory at U-Shift | Associate Professor of Transportation Systems at Instituto Superior Técnico
Mariza Queiroz	Smart sustainable mobility consultant | Vice-President of Mobility Research at UITP
Francisco Ferreira	President of Zero Association and Professor in Faculdade de Ciência e Tecnologia da Universidade Nova de Lisboa
Tiago Lopes Faria	Former Executive President of Metropolitano de Lisboa, CARRIS and Transtejo/SOFLUSA | Associate Professor at Instituto Superior Técnico
Camila Garcia	Senior Mobility and Transport Planner at Transportes Metropolitanos de Lisboa (TML)
Rui Gidro	Experienced consultant and Public Transport Partner at Deloitte
Luís Barroso	Former Deputy in the Office of the Secretary of State for Transport | Former CEO of Metropolitano de Lisboa, CARRIS and Transtejo/SOFLUSA | CEO at Mobi.E
Miguel Pinto Luz	Current Minister of Infrastructure and Housing | Former Secretary of State for Infrastructure, Transports and Communications
Pedro Machado	Planning and Financing Expert at TML | Former Mobility Adviser of the Deputy Mayor of the City of Lisbon
Susana Castelo	Director and Consultant of Transportes, Inovação e Sistemas (TIS)

Interviewee Name	Occupation/Expertise
Patrícia Melo	Associate Professor at Lisbon School of Economics and Management (ISEG) | Former Research Associate in the Centre for Transport Studies (CTS) | Specialities include transport economics
Cristina Pinto Dias	Current Secretary of State of Mobility | Board Member of the Autoridade da Mobilidade dos Transportes (AMT) | Former Comboios de Portugal (CP) Vice-President

The participants were approached through LinkedIn and email and the interviews were conducted virtually via Microsoft Teams, except for two which were held in person. The interviews lasted between thirty to sixty minutes and took place from June to August 2024, with the objective, in this specific time, of understanding the reality of public transport in Portugal, therefore making it a cross-sectorial investigation (Saunders et al., 2019).

The interviews were guided by a predetermined set of questions, which involved key topics such as the main challenges and barriers faced by public transport, the impact that public policy does and/or must have on the topic and the role that public transport occupies in the construction towards a more sustainable mobility. In addition, the public transport experience was thoroughly analysed, to understand what works, but more important the limitations of the service, which may influence users to choose other means of transport. Depending on the participants, these topics were addressed in different orders during the interviews (Flick, 2018). The interview guide can be found in the Appendix.

Initially, the interviews were transcribed automatically via Microsoft Teams and then verified and corrected by the researcher to guarantee the truthfulness of the information. This process was conducted in the spoken language during the interviews (Portuguese) and only the quotations were translated to English to minimize possible translation errors.

After the transcriptions were completed, the first cycle of coding began. Descriptive coding, which “summarizes in a word or short phrase the basic topic of a passage of qualitative data” (Saldaña, 2009, p. 70), was initially used to identify the main challenges, barriers and interventions that the participants considered that affect public

transport nowadays. In the second phase, focused coding, "that allows for the development of major categories or themes from the data" (Saldaña, 2009, p. 155), was used to develop the initial coding into major topics, permitting to track similarities in the opinions of the participants and pinpoint some crucial topics that were frequently mentioned.

To complement the interviews conducted, secondary data was also collected in the form of documents, reports, studies, news, demographic research related to public transport to validate the findings/opinions of the participants and to enhance the study with recent data and statistics regarding public transport.

4. Findings and Discussion

Although there are efforts being made towards fomenting a more sustainable mobility, there is still a huge imbalance between the use of private transport and public transport or other active modes of transport such as biking or walking. In Portugal, private transport represents around 68% of all work and school related trips (INE, 2024), leaving one third of the population to every other mode of transport available in the country. Therefore, it becomes urgent and necessary to study this reality. Building on the insights gathered from the interviews, it is outlined the challenges that need to be addressed, the barriers to overcome and the proposed interventions to foment public transport usage. A summary of the findings and recommendations can be found in Table III and is further elaborated in the following sections. In these, the challenges are detailed, followed by an analysis to the related barriers and a discussion of the proposed interventions.

Table III. Public Transport: challenges, barriers and interventions

Challenges	Barriers	Interventions
Public space and mobility reconfiguration	Excessive traffic Long term incentives to private transport	Eliminate, charge more for parking areas or locate it strategically Urban/congestion tolls and car restricted areas Eliminate company car benefits Creation of more segregated bus lanes Enhancement of traffic light management
Improve service quality	Lack of offer and infrastructures Shortage of investment funds Poor reliability Lack of available and accurate information Discomfort	Flexible or on-demand transport for rural areas Public transport network extension Explore new funding mechanisms Development of QR code scheduling system Broaden data collection
Foment of an integrated public transport network	Technology constraints Heterogeneous tariffs Management and organizational complexity	Open data systems to facilitate different services integration Development of better transport apps Foster Mobility as a Service and complementarity between public and active transport

Challenges	Barriers	Interventions
Change users' mentalities	Car Use Habit Stigma and stereotypes of public transport Lack of Environmental Concern	Mobility literacy and education Sensibilization campaigns

4.1 Public Space and Mobility Reconfiguration

First, and before diving into the public transport service, is important to understand the impact that external factors have on fomenting an unsustainable mobility, characterized by the predominant use of private transport. How public space is organized can have a severe impact on the attractiveness of private and public transport and was identified as being a crucial challenge to overcome.

'If the context and architecture of the space where people live do not promote the choice of public transport, and if its surroundings force them to incur in a greater effort than other mobility options, then it is very difficult for change to occur.' (Patrícia Melo)

The goal of transportation is allowing people to move from one location to another in the shortest time. Therefore, users will usually choose the mode of transport in which they think they will spend less time in.

'Time is very valuable (...) If we focus on saving time in public transport, guaranteeing that it moves efficiently and it does not get stuck, people will make the switch. If they realize that they can reach their destination faster by bus, metro or train than by car, people will opt for public transportation.' (Teresa Stanislau)

On average, Portuguese users spend twice as much time in public transport than on private transport in their daily mobility trips (PORDATA, 2023). Consequently, on metropolitan areas, speed was identified to be the primary motive for the choice of private transport by 62,9% and 58,8% of residents in Lisbon's and Porto's metropolitan areas, respectively (INE, 2018).

The main barrier that hinders public transport quick circulation is traffic. It can also affect private transport but *'people tend to tolerate less the negative aspects of public transport than those same negative aspects of private transport'* (Susana Castelo), possibly due to the comfort that it provides. Traffic not only affects the actual journey

time but also the waiting time of users in stops, making it more difficult for buses to fulfil their schedules, have accurate information and improve their commercial velocities, that have been gradually reducing and have hit historical lows in Portugal's main metropolitan areas (Soldado, 2024).

Besides public space, long term incentives to private transport such as the development of the national road network (e.g. Road National Plan of 2000), parking policies and fiscal benefits regarding company cars, continue to act as barriers and *'often act as discouragement for the use of public transport because they subsidize the use of individual motorized transport'* (Patrícia Melo). In a survey conducted to almost 300 Portuguese companies, 59% of them confirmed to offer company vehicles or subsidies to their employees (Marcela, 2023), a common practice since it brings more financial benefits for both the company and the employee to be compensated by a car than by a monetary raise.

'By awarding a car, the company is going to pay less taxes and the person compensated does not discount social security on that value. (...) It is urgent to end this logic of offering a car as a reward.' (Teresa Stanislau)

At a national level, these incentives are not coherent with the promotion of a sustainable mobility and public transport, highlighting the necessity for pursuing policies that diminish the use of private transport and improve the efficiency of public transport. Historically, incentives to the use of public transport are usually more well received than disincentives to private transport but there is a necessity for both. Nevertheless, and even if discouraging private transport with effective policies is seen as extreme for some, *'the end of combustion engine cars in 2035 and the increasing penalties on private transport imposed by Europe, will only make harder the lives of those who regularly use private transport'* (Miguel Pinto Luz).

On this behalf, several interventions were proposed, with the objective of restricting private transport mobility or making it more expensive. The first one is to either eliminate parking, set higher tariffs, or strategically locate it. For example, Lisbon City Council recently announced the possibility of parking for free in predetermined parking lots (in the city periphery) for holders of the public transport Navegante pass (Info Lisboa, 2024), to foment intermodality with public transport.

The second one is to create urban/congestion tolls, already tested and implemented in cities like London (since 2003) or New York, which recently adopted the same scheme for the area of Manhattan (Coen, 2024). Instead of prohibiting the use of private transport in predetermined areas, which was another intervention suggested, the government charges private transport users with a daily fee for entering in such areas. Despite agreeing with such measures, some interviewees alerted for the necessity of implementing them gradually.

'We do not need to frighten people by saying to them that their car is no longer an option. In fact, it is useful to have car parks and have ways for people, in an initial phase, to adapt to intermodality, where the car still plays a role.' (Francisco Ferreira)

'It does not have to be all or nothing. If a person nowadays uses the car for 100% of their mobility needs, we do not need for that number to reach zero. But, if they decreased that necessity to 50%, we already won. Because it means that in half of the days, the car was relinquished in favour of public transport.' (Susana Castelo)

Another intervention discussed was eliminating the benefits for company cars. For the situation to change, fiscal incentives and policies on this regard had to be rethought so that it is not beneficial tax wise to award a car instead of raising an employee's wage. This responsibility relies not only on the government but also on the companies, that can choose to reward employees with monetary increases and to develop *'corporate mobility plans which would not contain a policy of company car and parking'* (Filipe Moura). Instead, and contributing towards corporate social responsibility (CSR), could include other benefits such as offering to pay its employees monthly public transport pass or providing services of collective mobility, like company shuttles.

These interventions *'despite not directly improving public transport, are fundamental for rebalancing modal distribution'* (Tiago Lopes Faria) and to rationalize private transport use. There are situations where it makes sense to restrict private transport use because there are viable alternatives, in other situations this might not be possible. Consequently, interventions are also needed to encourage public transport as the best option and not as an alternative. They can be explored on two levels: public space and service quality improvements (addressed in the following sub-section).

Two interventions were highlighted as improvements to the public space which have a direct impact in fomenting public transportation: creation of more segregated bus

lanes and enhancement of traffic light management priorities. As seen prior, the commercial velocities of buses have been decreasing which means that the current bus lanes are not being effective in reducing travel time. A good and improved network of segregated bus lanes would allow to avoid major traffic complications, improve reliability and attract more users.

'If we improve our network of bus lanes, that will enhance public transport, which will naturally lead to more people wanting to use it. Consequently, this will likely result in a reduction of private vehicles.' (Carlos Teixeira)

Traffic light coordination, through AI mechanisms, is another way of reducing travel time and improve the attractiveness of public transport. That way *'the bus approaches the traffic light, then it communicates via wi-fi with it and gives priority for the bus to pass'* (Filipe Moura), therefore minimizing time loses in areas where traffic can be substantial, such as intersections.

It is very important to organize users' surroundings and space in a way that prioritises sustainable modes of transport. Nevertheless, people will not be satisfied, if the conditions offered by the public transport service cannot compete with the benefits of private transport. Therefore, *'the ideal is to create such good conditions for the utilization of public transport that, when one looks to the options available, quickly dismisses the car'* (Alexandre Machado).

4.2 Improve Service Quality

In the metropolitan areas, "does not drive/does not have a car" and "lack of alternatives" were identified by the population as the two main reasons for public transport use (INE, 2018). This means that *'people use public transport not because they want to, but because they have no other choice'* (Carlos Teixeira). Therefore, public transport is seen as a lower quality backup alternative to private transport. In this sub-section of the study, is going to be analysed the different barriers and possible solutions to improve the service. During the interviews, the first barrier identified was the lack of offer and infrastructures. Without it, the transition from private to public transport is impossible, because there are not alternative options that can satisfy the necessities of users.

'The general rule is that people use private transport because the levels of service of public transport does not meet their needs.' (Carlos Gaivoto)

Improving offer will either create new alternatives, connections, stops, etc, or improve the frequency of existing routes and transports, which were highlighted as the principal barriers to public transport use in metropolitan areas (Vasconcelos, 2023). In Portugal, the lack of offer resulted from a disinvestment in public transport across the last couple of decades. From 1968 to 2022, the country lost almost 1000 kilometres in railways (PORDATA, 2023) that were either abandoned or removed entirely. This lost network aggravated the disparities in the interior and rural side of the country and was one of the reasons that caused the rural exodus, forcing many people to dislocate in the search for better conditions.

'Adequate infrastructures were destroyed, lines were closed and accesses compromised (...) In the interior of the country, there are still many municipalities without a single public service route. (...) And when we talk about depopulation and migration flows, of people leaving the interior, is natural since they have not a minimal service level available in these areas.' (Alexandre Machado)

Fixing this is a major struggle since Portugal's investment on mobility largely depends on European funds *'since there hasn't been much room in the national budget to implement major reforms and install new infrastructures, as it is necessary'* (Carlos Teixeira). And even if there were more funds, due to decades of poor choices regarding public transport (amongst other topics) and the current demographic situation, these would be largely allocated to the coastal and high-density areas.

Outside of metropolitan areas, due to the lack of demand, the system is largely unsustainable, overfunded and dependent on programs like PART, that consists in *'hundreds of millions paid annually by taxpayers so that the government can compensate service operators for executing a certain route for which, otherwise, they would never have profitability for'* (Cristina Pinto Dias), to guarantee and offer worthy public transport service for the minority of the population that "helps" not to overload the metropolitan areas.

Finding new financial mechanisms is crucial to expand the offer and infrastructures of public transport, that do not only come short on the railway. In the last 10 years, there were almost no extensions to the metro network in both metropolitan areas

(PORDATA, 2023), with only a very slight growth in Lisbon's network between 2015 and 2016. There was also a shortage of investment in securing new rolling stock or in updating the existing one and, for example, in Lisbon, from 2003 to 2022, the number of metro carriages stagnated (PORDATA, 2023). Regarding road transport, opinions differ between the interviewees. One states that *'there is a significant lack of offer'* (Miguel Pinto Luz), while others believe that *'the problem is the traffic that buses have to deal with every day, creating a service bottleneck'* (Carlos Teixeira). Data found, in an analysis of 35 of the biggest metropolitan areas of Europe, supports the second hypothesis, with Lisbon being the second city in Europe with the most bus lines (urban and regional), only behind Paris (EMTA, 2024).

Still on the offer side, there is another major barrier, which is poor reliability. Public transport can be considered reliable if it fulfils its obligations in the schedule that was initially set or, in other words, if it is punctual (Monchambert & Palma, 2014). So, it is as important that the service exists as it is for it to be on time and fulfil users' expectations *'because no one can consciously use public transportation if there is an element of unpredictability'* (Miguel Pinto Luz). In Portugal, users do not have reassurance that the public transport service will always be operational (especially in rail transport), mainly due to strikes and punctuality issues (Lopes & Ferreira, 2024; Garcia, 2023).

'While the lack of product in a shelf can encourage an increase in demand, the inexistence of a planned service will only diminish people's confidence and "push" them out of the system.' (Teresa Stanislau)

'How can I convince someone to stop using the car and start using public transport? First, we need to guarantee that the bus will be at the stop, at the time it was scheduled.' (Camila Garcia)

Lack of available and accurate information constitutes another barrier that needs to be overcome to improve public transport service. For the ones that use public transport regularly, what hinders their experience is the fact that, often, the service arrival times do not coincide with the information provided to users, *'creating a large uncertainty about whether people might spend much time waiting or not (...) and anguish ok knowing if they are going to get to their destination on time'* (Susana Castelo). For example, digital information panels on bus stops, despite constituting an improvement in metropolitan

areas, are sometimes inaccurate or broken. This aggravates the uncertainty of arrivals even more and penalizes severely the experience for users, that *'are more likely to tolerate a longer journey than a longer waiting time'* (Patrícia Melo). For the ones that do not use public transport, it was noted that people have a hard time understanding the offer available because of a shortage of digital information that is not available in a useful and easy way of access.

'Today, people do not know if public transport can meet their needs because this type of information is not shared. Public transport remains very closed to itself, only informing its current users, which means that those who are outside of the service, will remain that way.' (Luís Barroso)

There were several other barriers identified that can be clustered into one, discomfort. In their daily mobility, people want easiness of use. Everything that hinders their experience will likely reduce their overall assessment and perception of public transport. First and foremost, Portugal is currently struggling with the maintenance of the different equipment installed across stations (Alemão, 2024) and of the bus shelters, which either are outdated or suffering from poor installations (SIC Notícias, 2024).

'There is the problem with the maintenance of stations. Lisbon's metro stations continue to face severe problems regarding the maintenance of its equipment, like escalators. And I think that this damages the image that people have of public transport (...) Another problem was the removal of shelters, in bus stations, that happened during the winter, several months before the installation of new ones (bad planning). The new shelters also have problems: no lighting, plus excessively high ceilings and benches.' (Carlos Teixeira)

Second, and as a consequence of the lack of offer, overcrowding is one of top complaints by users (Garcia, 2023) and interviewees warn about what a growing frustration on the subject can lead to: *'If I arrive to the train or the bus station and I cannot get in because the transport is overcrowded, then I will probably quit if it happens regularly'* (Francisco Ferreira).

Lastly, lack of safety can be another determinant in mode of transport choice. Since private transport is perceived as a more comfortable and safe mode, it is important for public transportation to ensure that users' do not feel in danger at any part of their journey.

'It is not just about having a stop at a convenient distance from home, it is about being able to reach it safely. This includes not being exposed to pedestrian accidents (e.g. run-over), personal attacks (e.g. theft) and environments with social disorder, which makes us vulnerable and afraid.' (Filipe Moura)

Users expect a smooth trip, without the feeling of being exposed, for example, to collisions between vehicles. Women, especially, struggle to feel safe due to the exposure and greater likelihood of harassment, which continues to exist and has been concluded to be a significant hindering factor for public transport utilization by women (Chowdhury & Wee, 2020; Gardner et al., 2017).

'In particular, the female population feel more apprehensive and unsafe while using public transport, especially at certain times of the day. At night, it is much more likely that they would call a ride-hailing service rather than take the metro or the train.' (Cristina Pinto Dias)

It is also relevant to mention that, despite the several barriers highlighted, cost was not of them. The large majority of interviewees agreed that cost is starting to favour public transport due to the increasing costs of private transport (e.g. fuel, taxes) and because of the effort that was made in metropolitan areas towards fare reductions, with the introduction of new metropolitan passes at competitive prices.

'For all modes of public transport, there was a significant price shift (...), which was very important. However, we continue to have low utilization of public transport, which means that, from the various factors influencing users' choices, cost has somewhat lost its significance.' (Filipe Moura)

In sum, it is important to develop a positive attitude among users towards public transport, by providing a convenient, comfortable, safe, and reliable experience when riding any mode of public transportation (Beirão & Cabral, 2007). To do so, the interventions suggested were as following. Even though metropolitan areas have a larger populational density, the entire country should be covered by a public transport network and for this rural and the interior areas cannot be overlooked. Therefore, the first intervention suggested was investing in flexible or on-demand transport, since running a normal operation of services in those areas becomes quickly unsustainable.

'Outside of the metropolitan areas, we need to invest heavily in on-demand mobility, which some municipalities already offer. Additionally, it's important to identify the key routes where it should be provided public transportation to maximize the offer available.' (Francisco Ferreira)

This solution focus on shorter trips, the usual mobility of populations that are settled in a specific region. But, to tackle the population disparities, asymmetries and isolation in these areas, *'we need to invest in rail transport, especially to connect the rural interior to the more developed coastal areas'* (Teresa Stanislau). The National Rail Plan (Plano Ferroviário Nacional, n.d.) was a measure announced to promote the development of rail infrastructures, however more and accessible offer is continuously needed. Investment is not only needed on infrastructures but also on modernizing the existing fleet to improve the comfort of passengers and, consequently, their perception of the service. Funding is not easy to achieve but there are already some success cases where innovative strategies were used to obtain investment for public transport (Governo de Portugal, 2024).

'We managed to secure a €45 million support from the European Commission to promote greater competitiveness in our freight railway (...) and the rationale used was the negative externalities[1] *avoided by a train compared to a truck (...) It is estimated that one passenger of private transport generates four times the external costs of a passenger of public transport, with the same applying for freight service.'* (Cristina Pinto Dias)

Regarding information, as mentioned prior, an integrated information system needs to be developed (which will be further analysed in the following sub-section) and the information for those who are waiting for the transport has to be more accurate and predictable. So, another intervention mentioned was the introduction of QR codes in public transport stops, so that people can scan it and have all the relevant information in a matter of seconds and in a more organized schematic.

'Having public transportation schedules available at stops through a QR code is a very interesting aspect. This way, everyone with a smartphone can scan the code and understand in that stop which are the buses available, their routes, schedules, real time

[1] Negative externalities associated with mobility consist of social exclusion, greenhouse gas emissions, air pollution, congestion, noise and energy consumption

information, etc. This provides a huge advantage because when it is altered, there is no need for a paper replacement, is more effective, sustainable and quick.' (Susana Castelo)

In today's digital and fast changing world, information is key and through it, public transport entities and operators can better understand users' mobility patterns and preferences. Therefore, the last intervention suggested on the topic was investing in more methods of data collection to identify the dimensions that hinder the public transport user experience and understand changes in travel behaviour. For instance, in Portugal, for its metropolitan areas, the last significant and representative mobility inquiry was developed in 2017 (INE, 2018). The absence of this kind of instruments or their lack of regularity is an obstacle for well-informed political changes since the data available becomes outdated and no longer represents the reality of users' mobility needs.

'In Portugal, unlike many other countries, we do not have a regular data mobility instrument, like a travel survey. (...) Without gathering data in a regular and coherent way, it is very difficult to understand mobility as a whole and its dynamics, which are even more complex nowadays due to the complementarity between the different modes of transport.' (Patrícia Melo)

4.3 Foment of an Integrated Public Transport Network

Nowadays, mobility patterns are becoming more demanding, which creates the necessity for each mode of public transport to adapt and interact with one another to satisfy users' necessities. A very comprehensive and integrated service of public transport is immediately more competitive because it will improve users' easiness of use if they do not find difficulties in switching from different modes of transport. On the other hand, lack of communication and planning, regardless of being on the operator or management level, can be harmful to user satisfaction. The more the complexity of the process and transition, the more people will question the entire functioning of the service.

'When we look at other European public transport networks, we experience a seamless transition between trains and across different operators. In Portugal, however, the distinction between who operates the metro, bus, and ferry services is still very noticeable. To improve this, there must be better communication and synchronization across all modes of public transport to create a truly seamless travel experience.' (Mariza Queiroz)

To have intermodality, which involves the utilization of more than one form of transport during a single trip, without major disturbances, integrations on different levels are needed. Along the interviews, three types of integration were highlighted: financial, technological and organizational. Financial integration is basically *'having a single ticket/pass for a reasonable price that allows for people to go anywhere in any available mode of public transport'* (Pedro Machado), therefore surpassing the barrier of possessing multiple tickets or buying new ones every time that they choose to switch modes or operators of public transport.

'Despite Lisbon's Metropolitan Area adoption of a single pass that is used for the whole metropolitan area, there are regions in the country who do not benefit from the same public policy. Therefore, in those regions, it is still necessary to buy different tickets from different operators when travelling through more than one municipality, on a single journey.' (Carlos Teixeira)

Integrating technology to facilitate users' access to information is another step towards a more complete integration. Information is fundamental because if people do not understand the network of transports, how they can interconnect and what transport better satisfies their mobility necessities, then that is a barrier hard to overcome. Because, *'it is a matter of trust, if people cannot trust or do not understand the information, they will stop using it'* (Teresa Stanislau).

Lastly, the fact that there are several and different authorities managing the various modes of public transport causes inconsistency in decisions and even competition, since the interests do not always coincide. Despite all working towards improving the mobility efficiency of users, the management and organizational differences create a barrier to a better complementarity and communication between the different services.

'These are companies that respond to different entities. The Metropolitan of Lisbon reports to the central government, Carris is under the authority of the Lisbon City Council, and TML that manages the Carris Metropolitana services is under the authority of Lisbon Metropolitan Area, etc. The existence of different authorities and companies hinders the coordination between them (...) In our case (TML), we are the ones who design, plan and structure the metropolitan bus operations and services and, from that point on, the service is run by 4 different operators. We do not have any buses or drivers. Whenever we identify an improvement, the operators are the ones who implement it.

Regarding the operations of the metro, we cannot do the same because TML does not have authority over the metro and vice-versa.' (Pedro Machado)

In the interviews, there were interventions discussed to improve integration on public transport but also ideas on how to connect it with other services, therefore expanding the service to a completely new level. Inside the public transport sphere, financial integration can be considered as the one that has had the most progress in recent years. There were significant integrations and reductions of prices with the launch of the Navegante pass in AML (Metropolitano de Lisboa, 2019) and the Andante pass in AMP (Coentrão, 2019), meaning that *'cost was more or less solved in metropolitan areas'* (Teresa Stanislau). However, in the rest of the country, there is a lack of uniformization that hinders public transport use.

'Living in Lisbon offers the convenience of using the Navegante card and the same thing for Porto with the Andante card. But, for the rest of the country, there is a large number of different tickets.' (Cristina Pinto Dias)

The most crucial and highlighted intervention related to public transport integration consists in the necessity of integrating all the available information from the different modes of public transport. This would allow people to better plan their mobility, alleviate stress and reduce uncertainty regarding public transport travel time, which can determine users' mobility choices (Cats & Gkioulou, 2014). Nowadays, data is abundant and, as long as it is open and free to use, it becomes possible for transportation companies and/or the government to develop or outsource solutions (such as apps) from independent people, willing to collaborate in exchange for compensation.

'It is necessary to integrate information and I believe that digitalization is essential to do so (...) We should have increasingly reliable systems, where companies that manage transportation and its operations share open data so that young people (born in the digitalization era) or others can develop apps to ensure a much higher degree of useful information than what exists today. This might help people to gain appreciation for public transport, to become familiar with it and, most importantly, to use it.' (Luís Barroso)

By integrating this information in a single place or platform, users would be able to plan their mobility with ease and transport entities would not only be able to get more insights on users' mobility patterns but also understand where they can improve the

complementary of the different modes of public transport. However, for this to be possible, *'there must be more dialogue and collaboration between all stakeholders to reach a balanced and sustainable solution'* (Tiago Lopes Faria). On this regard, some open communication and data sharing protocols are in place and it seems to exist awareness on the topic since *'the Ministry, at the central level, is working alongside mayors and metropolitan areas to design a global Mobility as a Service (MaaS) model, capable of integrating data from all public transport operators'* (Miguel Pinto Luz).

Another intervention that surfaced in the interviews was the possibility of integrating public transport with other transport systems with the aim of providing new options and reduce private car ownership. In Portugal, especially in Lisbon, the latest successful integration of this kind consists in the gratuity of GIRA bicycles for those who possess the Navegante pass, which is the monthly ticket for the use of any kind of public transport inside the city or the metropolitan area (Lusa, 2023).

In the same way, one interviewee suggested the possibility of integrating public transport with private transportation companies like Uber or Bolt. Because, as mentioned prior, private transport will not seize to exist, crucial is to rationalize its use. This way, people who possess the Navegante pass would be able to have a free ride per month or a discount in a trip which would give them the opportunity of using a car for an occasional and more complex journey without owning one unnecessarily.

In Amsterdam (Netherlands), public transport information was integrated in the Uber app (Uber, 2022) which allowed to show "available public transportation routes, real-time departures and arrival times bus, metro, streetcar and even walks by foot" so that users could make an informed decision by having all possible information in the app. So, even if the constraints on the legal, technological and financial side are too big for the implementation of discounts and commercial partnerships, integrating public transport information in other transport platforms can still be useful for users to compare and possibly combine their transportation options.

4.4 Change Users' Mentalities

On the demand side, one of the biggest challenges faced today is related with behavioural issues, trying to understand what are people's mobility needs and how their experiences and environment affects their perception towards public transport. When addressing it in the interviews, two main topics stood out as the main blockers for a more

positive approach towards public transport: habit and attachment to private vehicle and a deteriorated perception of the quality of public transport.

The convenience and comfort that private vehicles provide is something very difficult to overcome, even if there are other suitable options. People develop a habit for it, which makes it very difficult to persuade them to relinquish that option. Furthermore, as of many years, in Portugal, private vehicles, are not only seen as the preferential mode of transportation, but also as a proud possession and a synonym of realization and independence.

'Private vehicle is cultural in Portugal (...) Up until my generation and a little beyond, the greatest achievement at 18 years of age was getting a driver's license and, if possible, owning a car.' (Teresa Stanislau)

As a result, nowadays, there is a significant number of people for which the car is the logical and natural choice, centring all their mobility necessities around it, regardless the characteristics and time of the trip. Also, this mentality, even if unintentionally, is transmitted across generations which escalates the challenge. For example, if around 50% of all Portuguese children between the ages of 6 and 18 years go to school every day by private vehicle (Albuquerque & Esteves, 2023) *'how can we expect that a child who has spent their entire life inside a car, when it comes of age, to suddenly start using public transport'* (Susana Castelo).

Due to the lack of investment in public transport, detailed in previous sub-sections, another problem was created. While private vehicles gain popularity, simultaneously, a negative image of public transport was constructed as a result of poor experiences and an overall deficit in the quality of the service. Despite still having a long way to go, public transport improved in the last decades. But this progress is not acknowledged, which can lead to a difference between peoples' perception and the reality of the service.

'It is very difficult for people between the ages of 35 and 60 to change to public transport no matter how much we tell them that it is great now, comfortable, with wi-fi, air conditioning, etc. They have a trauma regarding it and most times talk without even trying it.' (Teresa Stanislau)

People are not willing to experiment and, without that step, it is normal that their opinion does not budge. *'Several studies show that those who have the worst opinion*

about buses are the ones that do not use them' (Pedro Machado). The same applies to private transport users, who usually have lower perceptions of public transport than public transport users, which means that public transport is better than they think (Beirão & Cabral, 2007).

Public transport is also associated to those who lack alternatives, either because there are too young or too old to drive, or because they cannot afford a car. This creates social segmentation between those who possess the car and its inherent status and those who have to "settle" for public transport. Nevertheless, it is believed that *'this idea that public transport is only for the poor is gradually dissipating'* (Luís Barroso).

In promoting this mindset shift is also emphasised the environmental factor. As discussed in previous chapters, the transportation sector alone is responsible for a significant part of all emissions into the atmosphere, underlining the importance of offering sustainable transport options while also mitigating private vehicle use through the interventions discussed in the previous sub-section. Users can also choose to act and make decisions aligned with a greener mobility but, for the majority, the trade-off of sticking with that choice is usually too high.

'Although we often claim to be highly sustainable, the reality rarely matches this assertion. When faced with the trade-off between abandoning less sustainable modes of transport and the perceived loss of quality of life and comfort, the decision becomes difficult, and meaningful change doesn't occur.' (Mariza Queiroz)

Other factors such as money, time, comfort, etc, end up being decisive. There are few people for which the environment is a priority and is capable, by itself, to alter their life choices. These questions *'have more weight on the public projection that people make of themselves rather than in the definition and choice of their transport options'* (Pedro Machado).

An intervention to change users' mindset regarding public transport that was proposed is investing largely on the education of more environmental and socially responsible behaviours with the objective of demonstrating that sustainable choices can coexist with a high quality of life. As seen prior, people are "creatures" of habit and they will tend to adopt the behaviours to which they were exposed from a very young age. So, interventions on this regard, should focus, primarily, on younger generations since they are not attached to past habits and experiences. They can also act as a direct influence on

others which has been proven to be effective in the past with promoting other sustainable initiatives. For example, with recycling, studies shown that younger generations, after being exposed to the topic, can have a strongly impact within their families for the adoption of a different lifestyle and behaviour (Maddox et al., 2011; Deng et al., 2022).

Interventions in schools could be beneficial so that the younger generations can be exposed to public transport and its benefits from a young age. That way, they would overcome what can be called as transport illiteracy, avoid growing without any knowledge of how the system works, the options available, which would allow them to make more informed choices in the future.

'Nowadays it is common to talk about the need to gain financial literacy to learn how to manage money, pay taxes and make investments (...) We also need literacy when it comes to mobility. Learning these basic concepts, which are fundamental to our daily lives, will benefit society as a whole.' (Camila Garcia)

Recently it was announced that pilot projects, which include the integration of a new subject for secondary schools in Portugal called "Literacy and Data", will start to be applied in the next academic year (Jornal de Notícias, 2024). For the moment, it only includes financial literacy, without any further disclosure on other possible topics of study. This could be an opportunity to start raising awareness and exposing teenagers to the challenges that mobility faces and the benefits of public transport. Furthermore, it was also suggested during the interviews that public transport entities and operators, like TML, CP, STCP, Metropolitano de Lisboa, etc, could go to schools and explain how to use their services, the different tickets and discounts that exist and where to retrieve all necessary information needed for a comfortable and pleasant journey.

The other intervention proposed regards sensibilization campaigns to raise awareness and display the opportunity cost between the use of private and public transportation. Therefore, it is crucial to foment a more critical thought process by deconstructing the idea that private transport is beneficial from a financial perspective.

'When calculating the costs of car, people tend to only consider the cost of fuel. They do not account for the depreciation of the car, insurance, tax or anything else. Sometimes, they do not even consider parking costs. It is necessary to demonstrate to people that one kilometre by car costs more (economically and sustainably) than that same kilometre by public transport.' (Teresa Stanislau).

Sensibilization campaigns should also focus on the environmental and sustainable advantages that public transport provides. Nevertheless, the improvement of the offer and service is considered to be the top priority since every positive advancement on the *'image of public transport can be destroyed, immediately after, by a bad experience'* (Alexandre Marvão) and because *'environmental values and/or awareness, or even public health on more general terms, is usually a bad predictor of behaviour change'* (Patrícia Melo).

5. Conclusion

Regarding transportation, it is unanimous that the modal transfer between private and public transport is inevitable or else the decarbonization of the sector will never be fulfilled. For this transition to occur smoothly, users' behaviour, necessities and patterns must be analysed to guarantee the best possible experience.

Public transport needs interventions on several areas so that it can compete with private transport and attract more users to the service on a regular basis. Therefore, with the objective of understanding the lack of progress of recent years and foster development onwards, public transport in Portugal was analysed based on the perspective and knowledge of experts in the field.

It was concluded that it is just as important to improve the quality and connectivity of public transport as it is to ensure that the surrounding space encourages its use. Furthermore, after acting in such dimensions, it is also relevant to communicate the changes to people and to do it in a way that persuades them to try the service. Public transport and mobility, in general, need to be functional, interconnected, to promote intermodality and connectivity, intelligent, and sustainable.

5.1 Theoretical and Practical Implications

At an academic level, this study provides a global overview on the reality of public transport in Portugal, therefore contributing to a more detailed understanding on the struggles that the service faces and how these can be overcome. Furthermore, it provides more knowledge on the transportation industry, on the importance of making it sustainable and the role of public transport towards achieving it.

Studies regarding public transportation are mainly user related, most commonly through surveys (e.g. Cheng & Chen, 2015; Murray et al., 2010) or via interviews (Beirão & Cabral, 2007). Therefore, a contribution to the literature is made by interviewing knowledgeable and educated experts in the field of public transport, sharing different views and opinions to find the main topics of agreement. In addition, the concept of barriers is scarcely explored in the transportation literature and this study, based on the approach by Blainey et al. (2012), created a basis for categorizing the different variables that hinder the public transport service.

From a practical perspective, this study conclusions allow for any interested stakeholder to use it as guidance on what is hindering the progress and development of public transport in Portugal and identifies some possible solutions to improve the service and the way it connects with its surroundings. This guidance can help different decision makers (government, municipalities, transport planners, operators, etc) to understand the root causes of the problems of public transport and direct them onto solutions that can positively impact people's mobility. It also raises awareness on how important a good system of public transport is to achieve a sustainable transportation industry and to combat inequalities and asymmetries in society.

Furthermore, this study aims to promote a more responsible behaviour from people in their transportation choices because a service fully capable and operating with quality is irrelevant if it is not accompanied by a shift in users' mentalities.

5.2 Limitations and Future Investigation Suggestions

Despite the conclusions and contributions above, this study presents some limitations. Due to its broad overview, the study presents generalization issues, meaning that some of its conclusions are not equally valid across Portugal's different regions due to its asymmetrical demography and conditions. Furthermore, covering both metropolitan and rural areas causes that neither context is explored in full depth. Future studies should focus on specific regions or settings within Portugal to better understand the mobility necessities and challenges faced by people with similar territorial, social and economic characteristics.

Another limitation is that this study would have benefited on more interviews with experts from different entities (e.g. AMT) and/or from more experienced people in the organizations contacted. This was not possible to achieve either due to a lack of contacts or because interview invites were left unanswered. For future research and depending on the scope of the study, more insights and knowledgeable opinions are valuable and it can be pertinent to segment experts for more detailed investigations on a specific mode of public transport, for example.

Also, this study does not consider users' opinions and experiences, focusing only on the perspective of experts in the area. Focusing in capturing the reality, preferences and pain-points of users, since their behaviour and necessities are growing in complexity, could be another relevant topic to pursue.

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Appendix

Appendix A. Interview Topics and Questions

Main Interview Topics	Questions
Progress and priorities in public transport	• Which are the biggest challenges that public transport faces? • Which are the biggest barriers that push people away from public transport?
Public transport demand and offer	• How is public transport demand forecasted? • Assuming the will to foment the use of public transport, what needs to be done to ensure that trips are frequent enough to fulfil user's needs? • Are the current infrastructures sufficient to cover the current necessities? If not, what needs to be improved? • Should the focus be on expanding the offer and the public transport network or just guarantee frequency and an overall reliable service with what already exists? • Is public transport accessible for all people? • Is the cost of tickets a concern when opting for public transport?
Public transport experience	• How aware are the different stakeholders of problems such as overcrowding and safety? What can be done to minimize the problem? • With technology rapidly improving and in an era of where information is key, how important is for consumers to have real time information and/or updates about the different modes of transport? What is being done towards minimizing this barrier? • Can people feel comfortable while using public transport or the commodity of private transport is impossible to compete with? How can the experience be improved?
Consumers awareness	• Is it possible to deconstruct emotional connection to private cars? • To what extent will consumers sacrifice the advantages of the car for contributing towards a greener mobility? Does sustainability affect their mode of transport choice? • Is there a group of customers (segment) where this change of mentality is already present?

Main Interview Topics	Questions
	• What is the role of education and social norms (common acceptable and appropriate behaviour viewed by society) in demystifying the less positive idea of public transport? • What image do people have of public transport? What can be done to alter it for the better?
Future of transport	• What is the role that public transport should occupy in the future of mobility? • What is the key to attract new users and to retain current ones?
Public policy	• What can be done in terms of public policy and governmental action to foment the use of public transport? • Is it possible to provide legislation/fiscal incentives for public transport? Or only disincentives for car use?