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ESTUDIOS DE DOCTORADO EN PERSONA  
Y MUNDO CONTEMPORÂNEO  
Departamento de Psicología Social

DOCTORAL THESIS  
**SERVICE DESIGN IN TRANSPORTATION:  
A CASE STUDY FROM PORTUGAL**

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2018

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DOCTORAL THESIS

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2018

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## **ABSTRACT**

Almada, a city in the south margin of river Tagus facing Lisbon, in Portugal, has a new light rail service that operates since September 2008.

This transport, result of a public/private consortium, was built from the efforts of Almada's City Hall and Lisbon Metropolitan Area (LMA) with the aim of improving people's mobility inside LMA.

Metro Sul do Tejo (MST) pre-project study was approved by the Portuguese Government with the commitment to involve public investment. But, usage numbers proved to be unrealistic, and MST's low revenues aligned with the economic crisis that Portugal faced during the years of 2008-2014, compromised the project. After eight years in operation the number of service users represents only 45 percent of original estimate and the construction of second and third phases is suspended.

Based on data gathered by the City Hall and MST we carried out a survey among MST's users to understand the causes behind such low usage rate. We found that MST had limited users' feedback in the project phase, and did not integrate processes of Service Design (SD).

SD evolved from other areas of design and gained importance as a reflexive and innovative user-centred process, applied to public and private services, namely in the transportation sector.

Data analysis allow us to inflect conclusions about the real impact of the tram line in the life of Almada's residents, and according to the survey findings, we will see that the service does not fulfil quality expectations nor safety and comfort requirements which were the biggest cause of complaints.

Literature reviewed about service design and a showcase of relevant transport projects which applied design tools, based a questionnaire submitted to service designers, that allow us to reach conclusions about what influenced the low revenues of the service.

At the same time, conclusions from the designers survey point out three main challenges for service design that concern a) the overuse of technology; b) the use of SD tools and processes displaced from their purposes; and c) the necessity of designer's political engagement, as a way of creating positive impact in communities.





# CHAPTER 1

## INTRODUCTION



## BACKGROUND AND CONTEXT OF THIS RESEARCH

**M**y main field of work is communication design and for the late 20 years I have been working as a graphic designer mainly in the editorial area. Since the year of my graduation, communication design and design in general have evolved exponentially in terms of tools and environments in which they operate. If once related to art, design has become inseparable from technology, digital media, or the computer, whose ease of use sometimes masks the conceptualization and proper application of design methodologies. However, if we abstract ourselves from the speed and complexity of processes with which we are confronted today, we recognize that like before, the core of design remains the development of appropriate, assertive, user-friendly projects, facilitating the tasks performed by users and presenting solutions with the ultimate goal of improving their life, and their interaction with objects and systems.

Service design is a relatively recent area of design that assembles a primal research strand, while at the same time posing pressing problems that need to be solved with a practical perspective. As in other design areas the process used in projects' development is of utmost importance for the success of their outcome.

When I started this study my aim was to broaden my knowledge about service design. I wanted to understand what tangible innovations this area has brought to design in general, and in a particular way, why is it an area of knowledge so "popular" in research media.

My interest was theoretic, in an attempt to understand the processes, tools, and innovations proposed by the field, but also of their practical application in systems, then experienced by users and contributing so relevantly to their quality of life.

After setting this thesis' theme, I decided to apply it to a concrete service and therefore focus the object of this study.

The area of transport with all its implications in terms of environmental sustainability, social

impact and design relevance was interesting for this research and Metro Sul do Tejo, the case study presented here, was within my reach which would facilitate the delivery of results.

On the other hand this particular study allowed me to use design methodologies, which are closer to my way of working and I consider an added value in the development of any project. I live in Almada, a city that was built without an urban plan and has today around 176 000 inhabitants. The historic part of town dates from the 19<sup>th</sup> century, with tight streets, small houses and lack of infrastructures like parking or green areas. The “new centre” is from the 60’s (20<sup>th</sup> century), with more regular main arteries, but still with an immense lack of green and pedestrian areas or places where the inhabitants can enjoy the city without being constantly immersed in traffic and noise.

Due to its proximity to Lisbon, many people chose Almada to live, benefiting of lower housing costs and from its location near the sea. The city was in its beginning a dormitory for families that travelled everyday by ferry, private auto or bus to the other side of the river.

In the 1990’s the affluence of people travelling each day to the river north’s margin, along with the lack of efficient collective transports, was the cause of massive traffic congestion in the bridge at rush time. This situation grew worse, directly proportional to the rise of people’s income and the access to consummation goods.

In the same period the city sprawled and the construction outside its outskirts grew, creating areas only accessible by private transportation or where transport network was very deficient. These problems were addressed by the City Hall of Almada in the *21’ Accessibility and Mobility Plan* (Câmara Municipal de Almada, 2002) which setted several intervention axis inside the county and other neighbouring counties, with the aim of improving collective transportation network and inhabitant’s mobility. It’s principles were:

- a) Accessibility improvement to the city of Almada and inside the county;
- b) Public transportation network improvement, with “cleaner and environmentally friendly transports”;
- c) More parking offer for residents and short time users, with the aim of reducing illegal parking and organizing roads;
- d) Public space upgrading, reducing noise caused by traffic in residential areas and contributing to air quality’s improvement;
- (e) Improve road safety for drivers and pedestrians, especially in areas close to schools and public services.

Grounding on the *21' Accessibility and Mobility Plan*, City Halls from South Metropolitan Area of Lisbon integrated a work commission to study mobility solutions in the counties involved, including Almada, Seixal, Moita, Montijo, and Barreiro. The result was the project of a light rail service to be implemented in all the territory, for better commuting the south river margin to Lisbon.

The new service, named *Metro Sul do Tejo* (MST) based on a public-private agreement, had a substantial part of the investment made available by the State (support of European funds), and another being supported by private companies (a consortium defined in a public competition) that would be responsible for the service's construction and exploration.

MST's first phase of construction (connecting Almada to Seixal) started in 2003, and lasted until 2008. Works were surrounded with controversy and all the promised benefits of this "clean and inclusive" service were erased by its allegedly negative effects and lack of planning.

When it started to operate, MST did not have the positive reception that was expected and gathered many sceptical and disadvantageous public perceptions.

In main streets and surroundings from Almada where the line was being built, the confusion was total. Shops closed because of dust and bad accessibility, traffic was diverted from main arteries and people simply changed their routines and started shopping or meeting elsewhere. Lines 1, 2 and 3 were concluded when the Portuguese economic crisis was still on its beginnings – in 2008; investment had already been approved by Portuguese government with a strong push from the involved city governors (Almada, Barreiro, Moita, Montijo and Seixal).

After three years in service, MST's investment model (public/private consortium) proved to be out of alignment with the number of existing users, and clearly unfavourable to the State that soon started to question its viability.

## **INTEREST AND RELEVANCE OF THIS STUDY**

This research main interest is the study of an existing public transport, and we hope to have contributed to the reflection about *Metro Sul do Tejo's* low results and what were their causes, in an attempt to infer conclusions about good service design practices (or their absence).

We raised questions and suggested practical solutions that may be of interest for MST or other transportation services, and thus avoid errors that were committed during the implementation of this service.

During this work we verified that there are few academic papers presenting service design case studies, and we did not find any in transportation, this study could therefore add knowledge about an important field that needs practical solutions.

The literature review carried out allowed us to contrast points of view and different archetypes about service design, adding the results of a questionnaire answered by service designers who state relevant conclusions about the role of the designer in a highly technological society.

### **A LIGHT RAIL SERVICE IN ALMADA**

Portugal is a small country located in the far west of Europe with borders with Spain (northern and eastern), and surrounded by the Atlantic Ocean in the west and south.

Since ancient times this unique geographic position has influenced the life of people settling there to live or just passing through. The history of the Portuguese people was always a history of travel and migration, inside and outside the territory.

Through centuries the demand for better living conditions, better employment, the gradual abandonment of work in the primary sector, especially in agriculture, was responsible for people's movements towards the country's coastline (movement reinforced during the 20<sup>th</sup> century), causing a greater population's concentration along the coast.

According to 2011 Population's Census, 58 per cent of the population live inside the main metropolitan areas (Lisbon and Oporto), and 42 per cent of the population live outside these areas, in what corresponds to 83 per cent of the Portuguese territory (Sousa *et al.*, 2011).

The most populous cities, among which Lisbon, Oporto, Aveiro, and Faro, are located near river mouths or the sea, benefiting from this location with better road and river access, milder climate, and greater centrality to the rest of the country.

These cities also have a higher concentration of services and employment, universities and schools, creating, in the end, a very heterogeneous country with densely populated areas in the great cities and surroundings, and almost deserted in the interior.

The gradual "abandonment" of regions farther away from the ocean, and the population's emigration, limited private investment in more remote areas of the country, and also conditioned state investment in sectors such as energy, urbanization, road network and transport.

Living on the country's coast has become synonymous of higher *per capita* income, greater access to schooling and employment, and greater mobility: the investment in infrastructures, road network and public transport was mainly reinforced in main cities and accesses around them. At the same time, the improvement of the living conditions and income, in big cities, made the access to consumer goods that were inaccessible to most population before 1974 (the year of the revolution that deposed the dictatorship in Portugal) easier.

Building more road networks and narrowing the links between urban areas was not only a question of shortening distances, but also an effect of the exponential rise of vehicles circulation inside and outside cities. The existence of more motorways increased accessibility outside metropolitan areas, but within these the effects of more vehicles circulating impacted negatively on people's life, and on their mobility, security, health and air quality.

## **POPULATION'S MOBILITY**

The usage of private transport grew gradually during the 1980s and 1990s, inversely proportional to public transports' usage. The numbers from population's *Census* in 2001 report the rise of 19 per cent in the use of private vehicles between 1991 (with a value of 27 per cent) and 2001 (with 48.7 per cent); these are the most common means of transportation for commuting movements (daily voyages home-work and home-school) in metropolitan areas (Lisbon and Oporto) and other cities with more than 50 000 inhabitants, "*private transport constituted in 2001 the main means of commuting in all the subregions of Portugal*" (I.N.E., 2001, p. 65).

In 2001 the Peninsula of Setúbal registered the highest percentage of individuals moving to other regions, and traveling daily to work or study – 15.9 per cent of inhabitants (I.N.E., 2001). In the same period the use of public transport (train or bus) decreases dramatically. Usage numbers are very low in the interior of the country, where network coverage and infrastructure is insufficient to serve the population, prevailing as in the rest of the territory, the share of individual transport; "*between 1991 and 2001 the collective transportation use quota decreased by 6.3 percentage points*". (I.N.E., 2001).

Lisbon Metropolitan Area<sup>1</sup> (*see image 1*) has the highest percentage of public transport use. 1. The Lisbon Metropolitan Area has the largest population and economic concentration in Portugal. Within his 18 municipalities, which constitute 3.3 per cent of the national territory, there are almost 3 million inhabitants,



age – more than 30 per cent of employees or students travel in public transport. Barreiro with a quota of 39 per cent, is the only city in the country where public transport numbers are higher than private transport, followed by Almada with 38 per cent, Amora, Queluz and Odivelas with 36 per cent. Amadora and Agualva-Cacém have 35 per cent, Seixal 34 per cent, Lisbon with 33 per cent, Sacavém with 32 per cent and Costa da Caparica and Loures with 30 per cent – all cities in the Lisbon Metropolitan Area. (INE, 2014, p.11).

**Image 1. Lisbon Metropolitan Area**



Source: <https://www.apontamentosn.net>

As with bus, rail network usage was considerably reduced in the period between 1990 and 2010, when many stations were deactivated, especially on connections in the country's coastal strip, and longitudinal corridors, south and central.

In 2009 the rail network had an extension of 2 841 Km<sup>2</sup>, serving a population of approximately 8.5 million inhabitants. Meanwhile, several problems with the infrastructure that was

---

about ¼ of the Portuguese population. It concentrates about 25 per cent of the active population, 30 per cent of national companies, and 33 per cent of employment. LMA has 2 821 697 inhabitants and its surface has 2 921,90 km<sup>2</sup>. ([www.aml.pt](http://www.aml.pt))

not modernized become visible – poor inter-modality in the transport system, lack of efficient connections to the rest of Europe, poor supply in national territory for those who travel outside the metropolitan areas and the coastal corridor (Ministério da Economia, 2014).

*“In the last 40 years, an obvious change affected the railroad: more than a thousand kilometres of railroad lines were deactivated.”* (Jornal Sol, 2017). There are areas of the country in remote northern locations (Trás-os-Montes) or center (Beira Alta and Beira Baixa) and south (Alentejo) where train lines do not operate, making access almost impossible for those who do not own a private vehicle.

The economic crisis that affected countries worldwide, in the years of 2008-2013 severely impacted in Portugal on all sectors of economy, including transportation. Several causes for the crisis were identified and directly related with the decrease of transports’ demand, goods and passengers transportation (Lopes, 2014).

The crisis was also a cause of the low investment in transport infrastructure registered in Portugal between 2011 and 2014 (*see Table 1*), during that period funds were essentially applied in roads’ construction.

**Table 1. Transports infrastructure investment in Portugal**

| Year | Investment<br>(thousand of €) | Year        | Investment<br>(thousand of €) |
|------|-------------------------------|-------------|-------------------------------|
| 2004 | 170.000                       | 2010        | 127.000                       |
| 2005 | 134.000                       | <b>2011</b> | <b>102.000</b>                |
| 2006 | 103.000                       | <b>2012</b> | <b>64.000</b>                 |
| 2007 | 82.000                        | <b>2013</b> | <b>53.000</b>                 |
| 2008 | 135.000                       | <b>2014</b> | <b>45.000</b>                 |
| 2009 | 151.000                       | 2015        | <b>80.000</b>                 |

Source: Ministérios | International Transport Fórum (ITF) OECD.  
in Pordata.pt/DB/Europa/Ambiente+de+Consulta/Tabela

The years between 2000 and 2010 were characterized by the divestment in other infrastructure for transport and road transportation (*see Table 2*), with *“the investment in the rail sector mostly being carried out in the maintenance and improvement of the existing infrastructure, to the detriment of the network’s expansion”* (Pereira, 2015, p.103).

**Table 2. Total investment by large type of infrastructure**

Thousands of €

| Year | Infrastructure Road Transport | Other Transport Infrastructure |
|------|-------------------------------|--------------------------------|
| 2000 | 1.841 225                     | 875 604                        |
| 2005 | 2.667 374                     | 102.000                        |
| 2010 | 2.272 226                     | 598 461                        |
| 2011 | 1.648 060                     | 440 559                        |

Source: Pereira, 2015, p. 195.

The railway transportation network suffered a setback with the systematic lines deactivation and, all over the country, the development of public transportation systems was suspended during crisis years, and network expansion was left in stand-by, with greater impact in more populated regions, like in the case of Metropolitan Areas of Lisbon and Oporto. In these cities, the bus and underground public services were reorganised with the purpose of reducing costs and projected network expansion was suspended. (Boaventura, 2011).

The inefficiency of collective transportation and intensive usage of private vehicles affected life quality and mobility in big cities. *"In larger urban centres, traffic congestion causes losses in productivity, quality of life and health (increased stress, in particular by high noise levels)."* (OECD, 1996, p. 60).

The excess of traffic circulating inside and towards city centres was also responsible for the large number of accidents and insecurity: road accidents in Portugal were in 2001 of 42 521, causing 1 466 deadly victims. The majority of these accidents occurred inside urban areas (28 735, corresponding to 67 percent of the accidents from that year) and 49 percent occurred in municipal and national roads. (Ministério da Administração Interna, 2001). In 2011 road accidents have decreased but were still high comparing with other European countries; the Road Security Observatory reported 32 541 road accidents with 891 mortal victims (Autoridade Nacional Segurança Rodoviária, 2011)

People spend much of their day moving to and from work, mainly in their private cars: *"In 2001, travel in large urban centres is slow, commuting between the Setúbal Peninsula and the greater Lisbon can take 30.5 to 29.7 minutes, reflecting the mobility rates of these urban centres."* (INE, 2001, p. 65).

## **GREENHOUSE GAS EMISSIONS/ GLOBAL WARMING**

The situation in Portuguese transports is similar to the rest of Europe, where the private car is the most used transport *"between 1950 and 1990 the number of motorised vehicles in the world grew from about 75 million to 675 million, with vehicles used primarily for personal transportation."* (OECD, 1996).

The uncontrolled growth of vehicles circulating, based on carbon-intensive fossil fuels (with numbers rising each year), created concerns about climate, planet's natural resources and global warming: *"Almost all transport is based on oil reserves and oil consumption. (...) The burning of fossil fuels to provide energy for vehicles results in several kinds of emissions into the atmosphere. The major global impact of transportation results from release of carbon dioxide, CO<sub>2</sub> traps the sun's heat causing an increase on the planet's surface temperature."* (OECD, 1996, p. 20).

Transport sector was responsible for 21 per cent of greenhouse gas emissions in UE in 2003, with high concentrations of CO<sub>2</sub> – Carbon Dioxide, (eu.europa.eu, 2003), which lead to the implementation of policies for climate protection, (by EU and Governments), with the aim of restricting private vehicle circulation: *"Both require the reduction of the use of carbon-intensive fossil fuels by more energy-efficient vehicles, alternative fuels and changes in mobility and location behaviour."* (Wegener, 2010, p.9)

Measures to reduce the greenhouse emission worldwide, were accorded under the *Kyoto Protocol*, in 1997, and in following documents like the *Marrakesh Accords*, 2001, and the *Doha Amendment to the Kyoto Protocol*, in 2012.

In Europe, the commitment to reduce greenhouse emissions resulted in policies to restrain vehicles circulation, reduce the number of accidents, and Co<sub>2</sub> emissions: Germany implemented the LEZ (*Low Emissions Zone*) in Berlin, limiting the circulation of cars older than 2000 to certain areas of the town outside the centre. This allowed the reduction of 24 per cent of exhaust particulate emission and 14 per cent lower Nox (Nitrogen Oxides) emissions. Traffic decreased also by 4 per cent inside LEZ and 6 per cent on surrounding areas. (Pardo, 2011, p. 34).

In London, the City Hall introduced in 2003 a *Congestion Charge* (with a daily fee of £11.50) for all vehicles driving Monday to Friday inside the charging zone, between 07:00

and 18:00 hours. Its goal was to reduce high traffic flow and pollution in the central area of town while raising investment for London's transport system.

Lisbon's City Hall created a *Reduced Emissions Zone – ZER*, where cars older than 1996 cannot circulate on weekdays. The policy dates from January 2005 and the City Hall re-enforced it with the implementation of pay and ride services based on electric vehicles, soft mobility and energy efficient public transports.

Greenhouse gas reduction policies will contribute to invert the dependence on non renewable oil sources and promote more sustainable behaviour and public awareness about climate change. They will also, in the medium term, improve life quality for people living in urban communities: *"a continuing trend towards urbanization, with strong population growth, suggests that by 2050 an additional 2.5 billion people will be added to cities around the world."* (WEF, 2016, p.9).

## **PUBLIC TRANSPORT UPGRADE/ EQUITY**

Concentrated urban areas will allow shorter and faster connections, solving mobility problems for those who daily travel long distances, but sustainable mobility has other implications besides urban planning. Banister defines principles of sustainable mobility that include land-use development, planning and regulations' integration *"Improve levels of proximity would help to reduce distance travelled, and contribute to trip reduction and modal split changes."* (2007, p.78) and also other variables like technology usage and efficient information to commuters in public transport systems: *"Making the best use of technology, including investment in transport modes, information systems and in the transport system itself."* (*ibid*, p.79).

*"A sustainable mobility approach requires action to reduce the need to travel (less trips), to encourage modal shift, to reduce trip lengths and to encourage greater efficiency in the transport system."* (Banister, 2007, p. 74).

Implementing transport services that are environmentally friendly, based in new technologies and equitable for the population is a key-issue to improve people's life. The option for collective transport against private vehicles is part of the solution for reducing CO<sub>2</sub> emissions *"improving poor air quality in cities; reducing congestion and improving urban public space and quality of life."* (LSE cities, 2015, p.6); but sustainable public transport include more than improving mobility, it requires *"strengthening various features of the system in-*

*cluding accessibility, affordability, social equity, efficiency, safety, security, convenience, low carbon, comfort, and people and environment friendliness.*" (Pardo, 2011, p. 8).

More options for travel do not mean equal conditions of mobility, specially in less developed countries, where individuals with lower income, poor, disabled, women or elderly still have limited access to transports " *there is much less accessibility for lower-income groups (and vulnerable groups in general) due to high/inequitable transport fares, lack of public transport to areas where low-income populations live, and lack of safe and high quality infrastructures for these users (including sidewalks, which are often neglected in favour of roads).*" (Pardo, 2011, p. 7). Low capacity for travel directly impacts on accessibility to jobs, education or health, reducing the participation of these groups in society.

Expensive transport infrastructure projects inside central urban areas are normally prioritized, neglecting populations from cities' outside fringe, who will necessarily need more time to access services and jobs. " *Job accessibility should become an essential ingredient in planning sustainable transportation systems, so that the social equity aspects of metropolitan areas in developing cities can be enhanced.*" (Thakumiah, 2009, p. 75).

Elderly people are also an often neglected group in the access to public transport, as in other services that rely greatly on new technologies. Technologies are changing the user experience towards transportation, with the integration of mobile devices ticketing, real-time route finding, applications for interacting with services that may pose problems to non frequent users, info-excluded, handicapped or seniors.

European population is aging and this is a matter of concern that directly implies on the way these projects will be addressed " *in 1900 the average global life expectancy was around 40 years old, now is currently close to 80 years old*" (WEF, 2016, p. 10).

## **ENVISIONING A SOLUTION**

With the goal of minimizing environmental impact, EU governments implemented policies to push down the use of private vehicles, encourage the use of public transport, reduce motorization and accidents, and in general change behaviours towards a more sustainable way of living in Europe.

These measures include transit oriented strategies, the promotion of urban development along mass transit corridors, inclusive and equitable means of transport with user-centred concerns, and options like non-motorized transport (walking and cycling), "greener"

transportation systems like light rail and electric vehicles, or the update of transports and connections outside urban areas.

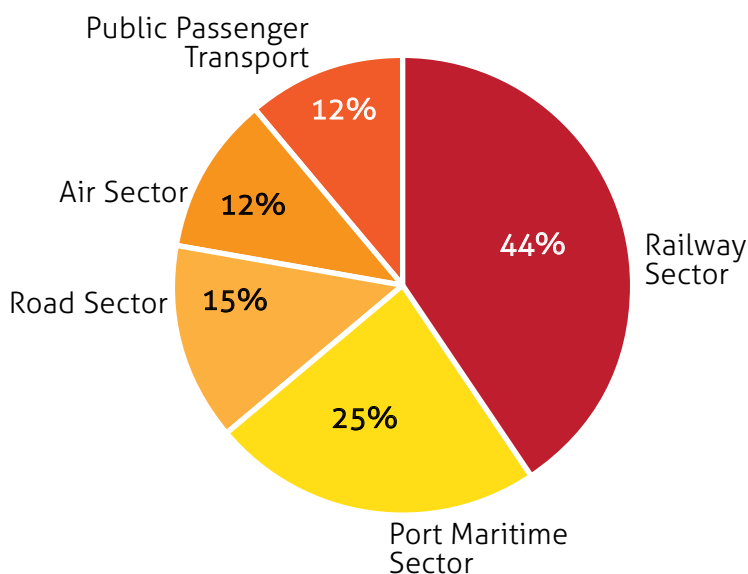
In Portugal during crisis' years all efforts towards the implementation of greener transportation systems or network expansion were suspended. Just after the year of 2014 the State restarted to invest in transportation or to reschedule projects that were left in stand-by. In 2014 a Strategic Plan for Transportation and Infrastructures (*PET*) was created (by the Portuguese Economy Ministry), with the aim of analysing and proposing solutions to the public transport situation, considered unsustainable and catastrophic. "*PET has highlighted the inability of transport and infrastructure in the public sector, and the inevitability of profound and urgent reforms.*" (Ministério da Economia, 2014, p. 8).

Amongst the measures advocated by *PET* stand out: a) creation of a comprehensive transport network and infrastructures inclusive and inter-modal, for the whole national territory; b) establish public passenger transport services at local, regional and national level, allowing the migration of individual transport to collective transport.

*PET* establishes priority investment areas (see figure 1) for the period between 2014 and 2020, with the aim of bringing Portugal closer to EU environmental targets, improving traffic conditions in and out urban centres, reduce traffic congestion on major access roads, and increase the use of collective transport.

**Figure 1. Priority investment projects**

Investment Breakdown by Sector



Source: Ministério da Economia, 2014, p. 76

This analysis of the Ministry of Economy will base future transportation projects, and take up with the work previously carried out in the transport sector, aiming for a reversal of the mobility networks' national situation.

In 2017 Gross Domestic Product (GDP) increased by 2.7 per cent in Portugal (INE, 2018), and envisage a more favourable economic / social situation reinforced by the stable political period in the country, which directly impacts in issues such as employment and health insurance but also in the transport and mobility sector, seen as a prerequisite for a more balanced life in all the territory.

## **AIMS AND RESEARCH QUESTIONS**

My main goal for this research is to increase my knowledge about the field of service design and its relation to other design methodologies involving participation and communication.

Since communication design is an essentially practical area, focused on the structure of information that will later be apprehended differently by its receivers (implying for the designer a continuous testing and a deep knowledge of the target audience of his work); a parallel can be established with the design of services insofar as the latter must understand interaction strategies between individuals and other more abstract factors such as their perceptions and their expectations towards a service.

A collective transports service such as the MST is a continuous field of interactions, constantly changing, that needs to be structured from a functional point of view so that the service is suitable for its many users, but also from a less measurable, more subjective perspective.

According to numbers and studies about the MST's usage and financial sustainability, people's expectations were not correctly addressed on the first phase of this project and the expected results were far from planned. Something apparently failed and provoked this lack of interested and low public adherence to this service, but what were after all the situations that caused the poor results?

**The questions that this study intends to answer are:**

**What are MST's implications for the life of the city where it was implemented and in the lives of its inhabitants?**

**How did the design strategy defined for this project influence its results?**



## THESIS' STRUCTURE

This dissertation is divided in three sections.

After the Introduction, Chapter 2 includes two papers published during the course of this research.

The first paper *Metro Sul do Tejo: Improving mobility in Almada* introduces the object of this study, background and demographic characterization. In this paper we make an overview of the story of Almada, and its social developments that influenced the way it is nowadays and influenced the construction of a new light rail service: *Metro Sul do Tejo* (MST).

In spite of its purposes, MST did not meet initial user expectations (it presents very low usage numbers) neither seemed to have improved people's mobility inside the town and neighbouring counties, which was of its main goals.

Findings from this paper report that MST is not considered an option for the population living outside Almada's centre (as it was intended in the initial project); lack of funding and the economic crisis in Portugal were responsible for the interruption of works and just one phase of the project was concluded. Second and third phases of the original plan, which were not concluded, would extend the line within near parishes, which surely strongly impact on service results, raising user number, more accordingly with initial studies.

The second paper *Metro Sul do Tejo: Service design and user feedback* presents results from a survey and focus groups held with MST's users. The survey provided insights about user perceptions towards the service, further developed in the focus group sessions.

Evidence from the empirical study indicate that tangible and intangible aspects concerning users' interaction with the service could influence its adoption. Respondents raised questions about key issues like: security, lack of comfort at tram stops, bad coordination between transportation services, and staff poor interaction, that contribute to a negative image of the service. These questions relate to the design of the service and should have been better addressed in the preliminary project, but we did not find evidence that they were considered during the planning phase.

Evidence also showed that initial users forecast will never be accomplished if the initial project is not finished. At the same time, the service is considered infeasible without the State support, and the State is renegotiating the contract to reduce the compensations that are contracted with MST.

Chapter 3 presents the third paper from this research *Service design: Challenges in the transportation sector*. We found some case studies in the transportation sector which applied service design practices. The methodologies and processes used were considered relevant to solve issues that concern service usage.

There is no evidence of such practices or tools were applied on MST, and the project lacks feedback from its users, which could have been relevant to prevent some of the problems pointed out.

The paper provides a state of the art about service design, its evolution and influences from different areas of knowledge, and its direct impact on the transportation sector. It also presents the results of a questionnaire answered by service designers that expose their opinions about the present and future challenges of the profession, referring the importance of technology, ethical and sustainable concerns.

Chapter 4 discusses findings from the three papers and connects all topics referred on this research, and its line of analysis.

Chapter 5 concludes this dissertation that we hope to have been of interest for the reader.

## REFERENCES

Autoridade Nacional Segurança Rodoviária (2011). *Vítimas a 30 dias. Ano 2011*. Observatório da Segurança Rodoviária. Retrieved from <http://www.ansr.pt/Estatisticas/RelatoriosDeSinistralidade/Documents/2011/Relat%C3%B3rio%20Anual-%20V%C3%ADtimas%20a%2030%20dias/Relat%C3%B3rio%20Nacional%20Anual%202011-%20V%C3%ADtimas%20a%2030%20dias.pdf>

Banister, David (2007). "The sustainable mobility paradigm" in *Transport Policy* 15 (2008) pp. 73-80

Boaventura, Inês (2011). "Carris poupa três milhões de euros com corte de seis carreiras" in *Jornal Publico*, 3 de Março de 2011, Lisboa. Retrieved from <https://www.publico.pt/2011/03/03/jornal/carris-poupa-tres-milhoes-de-euros-com-corte-de-seis-carreiras-21466460>

Câmara Municipal de Almada (2002). *Plano de Mobilidade Acessibilidades 21*. Câmara Municipal de Almada (Eds.).

INE – Instituto Nacional de Estatística (2001). *Censos 2001. XIV Recenseamento geral da população. Resultados definitivos. Portugal*.

INE – Instituto Nacional de Estatística (2014). *Cidades Portuguesas: Um Retrato Estatístico – 2011*

Jornal Sol (2017). *25 de Abril. A volta que isto deu*. Retrieved from <https://sol.sapo.pt/artigo/559960/25-de-abril-a-volta-que-isto-deu>

Lopes, Ana Rita Nogueira Cortez (2014). *Desempenho do sector dos transportes em Portugal – o que trouxe a actual crise financeira?* Dissertação de mestrado em Economia, apresentada à Faculdade de Economia da Universidade de Coimbra. Coimbra.

LSE Cities (2015). *Towards New Urban Mobility. The case of London and Berlin*. London School of Economics and Political Science, UK.

Ministério da Administração Interna (2001). *Sinistralidade Rodoviária 2001. Elementos Estatísticos*. Observatório da Segurança Rodoviária. Retrieved from [http://www.ansr.pt/Estatisticas/RelatoriosDeSinistralidade/Documents/2001/Relat%C3%B3rio%20Anual/Relat%C3%B3rio%20Anual%202001\(PDF\).pdf](http://www.ansr.pt/Estatisticas/RelatoriosDeSinistralidade/Documents/2001/Relat%C3%B3rio%20Anual/Relat%C3%B3rio%20Anual%202001(PDF).pdf)

Ministério da Economia (2014). *Crescimento competitividade coesão. Para que tudo fique mais perto. Plano estratégico dos transportes e infraestruturas. Horizonte 2014-2020*.

OECD (1996). *Towards Sustainable Transportation. The Vancouver Conference OECD Proceed-*

ings. Vancouver March 24-27 1996.

Pardo, Carlos Felipe (2011). "Sustainable Urban Transport", Chapter 4 in *Shangai Manual – A Guide for sustainable Urban Development in the 21st Century*.

Pereira, Alfredo Marvão; Pereira, Rui Marvão (2015). *Investimento em infraestruturas em Portugal. Volume I: Base de Dados e Factos Estilizados*. Fundação Francisco Manuel dos Santos, Lisboa.

Sousa, João Figueiredo de; Fernandes, André; Galiaú, Sónia; Estevão, Mafalda; Antunes, Gonçalo (2011). *A Evolução dos transportes e acessibilidade e as transformações na organização do território*. Instituto de Dinâmica do Espaço.

Thakumiah, Piyushimita "Transportation and employment accessibility in a change of context of metropolitan growth: the case of Delhi, India" in *Projections*, Vol. 9 MIT Journal of Planning.

Wegener, Michael (2010). *The Future of Mobilites in cities: Challenges for Urban Modelling*. 12<sup>th</sup> World Conference on Transport Research, July 11-15, Lisbon

WEF – World Economic Forum (2016). *White Paper – A Field Guide to the Future of Mobility*.



# CHAPTER 2

## **METRO SUL DO TEJO CHARACTERIZATION**



# **METRO SUL DO TEJO: IMPROVING MOBILITY IN ALMADA**

**Proceedings ICCTE International  
Conference on Traffic and Engineering  
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**With Guillermo Talavera and Pilar Orero**





## METRO SUL DO TEJO: IMPROVING MOBILITY IN ALMADA

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**Abstract:** After four years operating, the Metro Sul do Tejo (MST), a light rail transport built in Almada – Portugal, has not fulfilled the initial expectations and may be considered a flop. The implementation of the modern, fast and non-pollutant public transport was part of the City Hall's political strategies to reduce pollution, noise and traffic congestion, creating therefore a more enjoyable city centre for its residents. A high number of users were estimated, assuring the financial viability of the project, and reassuring the State about the revenues of the large investment needed. Today, the number of users doesn't match those expected, and some issues such as the high percentage of fraud or MST held responsible for the closing commerce inside the city and for the so-called "desertification" of Almada. The project's second and third phases of construction are compromised. In this paper we examine the reasons that caused the fail of the service. Analyzing the data gathered by the City Hall and other documentation from the MST we inflect conclusions about the real impact of the tramline in the life of Almada's residents.

**Keywords:** Sustainable transport, mobility, transportation planning.

### 1. Introduction

The Metro Sul do Tejo (MST)<sup>2</sup> is a street tramline that was inaugurated in August 2008, when the first phase of its construction was concluded. The companies engaged in the project of MST were part of a consortium to whom belonged the City Halls of Almada, Seixal, Moita and Barreiro. These cities, part of Lisbon' Metropolitan Area – LMA, had the intention to improve mobility of their inhabitants and reduce the use of private transport in the accesses to Lisbon. Three phases of construction were estimated in the contract. Studies were made to prevent the impact from construction's work on the city and to estimate the number of users for the service. Public informative sessions were held by the City Hall, promoting debate over the benefits and disadvantages of the MST.

Despite all optimistic premonitions, after 3,5 years from its inauguration, the initial estimate number of passengers was not achieved, and the service revenues are much lower than what was expected. Almada's residents blame MST for the gradual "desertification" of the city, stating that the rail line increased the obstacles for people wanting to reach the centre of town. Many shops in the central streets closed during MST's construction and remained closed afterwards. Metro Sul do Tejo faces serious problems of economic viability and the government disapproves the continuation of works (second and third phases of construction), endangering the original purpose.

In this work I analyse the real responsibility of MST in the so-called "city desertification" of Almada, and why is the actual number of transport usage so low comparing with previous numbers. After this analysis some hypothesis that could give answers to the raised problems are debated.

In the remaining paper, Section II provides a general idea about the development of Almada, in what concerns its demographic and urbanistic evolution. The short insight of Almada's history has the purpose of facilitating the understanding of mobility problems that affect its inhabitants in our days. Section III presents MST and the main purposes from its project. The analysis of the real usage of the MST *versus* the expectations is presented in Section IV. In Section V hypothesis for the flop are given and finally, in Section VI we conclude.



**Fig. 1.**

*Map of Almada*

Source: [www.google.maps.com](http://www.google.maps.com)

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<sup>2</sup> Metro sul do Tejo (MST) Tram South from Tagus Tram Public transport, which operates in Almada.

## 2. The city of Almada and its mobility

### 2.1. Historical insights

When the Arabs settled in the place that much later came to be known as Almada, they were certainly not unaware of its natural beauty and unique conditions in terms of defence and relationship with the river. Archaeological remains dating from this period have been found in holdings such as Quinta do Almaraz, a wide promontory facing the river. The site had optimal conditions for the life of the people that settled there, subsisting through agriculture, fishing and trade. The Tagus River, was the main line of communication and trade between these people, constituting also a natural boundary and obstacle between the north bank and the south bank.

Throughout the middle Ages and the Renaissance, the county's land was organized in farms and remained like this until the seventeenth century, when the first industries settled there. During the seventeenth and eighteenth centuries, chemical and pharmaceutical industries were settled within the limits of the county, attracting people primarily from the south. In 1801 3.363 people lived in Almada, in 1849 the number of registered inhabitants was already 6.440. These values have dramatically changed during the twentieth century (See Table 1) that witnessed a slow and controlled urban growth, despite a sharp increase in the population. The affordability of land along the river, the gradual decline of agriculture and the industrial growth attracted people but also boosted the construction and urban redefinition of the then Village of Almada (Silva and Vieira, 1995). Access to places outside the county's centre was difficult and slow; people were forced to walk great distances in their daily commutes. Crossing the river to Lisbon was also a complicated and time-consuming process. Only in 1922 did the first diesel ferry (*Cacilheiro*) start to operate, carrying a small number of passengers between the southern and northern banks (Rodrigues, 1999).

**Table 1**

*Number of Residents in Almada per Year*

| Year | Residents number in Almada |
|------|----------------------------|
| 1801 | 3.363                      |
| 1849 | 6.440                      |
| 1900 | 15.764                     |
| 1930 | 23.694                     |
| 1960 | 70.968                     |
| 1981 | 147.690                    |
| 1991 | 151.783                    |
| 2001 | 160.825                    |
| 2008 | 166.103                    |
| 2011 | 174.030                    |

Source: INE. Census 2011

### 2.2. The urban plan of Almada

During the first forty years of the twentieth century many people were housed in shacks without running water or electric light and in 1936, the Municipality of Almada prepared a preliminary draft for the urbanization of Almada's southern slope (Rodrigues, 1999), demonstrating the growing concern with the chaotic way in which the county was developing. The cheaper land and the location along the Atlantic coast and river, near the capital, were major attractions, in contrast to housing prices practiced in Lisbon.

In 1945 the government signs a contract with Etienne de Gröer, renowned urban planner, and the architect Faria da Costa, for the implementation of Puca – Urbanization Plan of the city of Almada. According to Ana Bonifácio (2004) the plan of Gröer mirrored the ideology of the time and the vision of a city as a compartmentalized core, where the spaces for its various functions: housing, recreation, trade and services and industry were well separated from each other. The large avenues provided access to squares where the civic centre was installed (court, church, town hall), the commercial area, administrative offices, shops, small factories, garages, theatres and meeting rooms could also be found here (Rodrigues, 1999). The residential buildings complied with a hierarchy that was defined by social class from the residents housed there. The grassland areas outside the centre should be preserved, so that the construction would not adversely affect the enjoyment of the countryside, which also served as a reservoir of clean air and leisure.

With this model of functional city<sup>3</sup> – Gröer followed the vision of Le Corbusier, the great promoter of this idea of “separation of urban functions, multiplication of green spaces; rationalization of collective housing, creation of functional prototypes” (Carvalho, 2003) adding also the idea of an urban-rural design, where there was a more dispersed occupation of the land, a search of the countryside for the sake of health and contact with nature.

War in Europe and the difficulties that came upon it, led to a deterioration of rural workers living conditions, and increased the migratory movement towards the coast, creating even more pressure on these sites (Rodrigues, 1999). In 1945, Gröer created *Puca* taking into account a number of 100,000 inhabitants for the next 30/50 years; this number had already been exceeded by almost 48,000, just 40 years later (See Table 1).

### 2.3. Mobility

Although largely responsible for the establishment of people in the county, the river was also a natural barrier to circulation between the two margins. In 1944, 10.000 passengers crossed the river every day. In 1954, this number doubled, and there is a registry of 20.000 passengers doing this journey daily (Museu da Cidade, 2005a). The bridge over the river, a long discussed project, becomes urgent and it is at last inaugurated in 1966.

The bridge’s construction and the strengthening of existing links between the two banks of the river improved mobility, but it also caused the growth of urban denser areas near access roads to the bridge and river, thus leaving the interior areas of the peninsula more sparse, clearly benefiting the use of private transport and also allowing a more dispersed and disordered occupation of the Setúbal Peninsula’s territory.

The use of private transport was somewhat refrained during the 70’s due to a global oil crisis, but in the 80’s “traffic on the bridge accelerated again to extraordinary rates of growth of around 6,5 percent per year” (Museu da Cidade, 2005a). These values increased exponentially during the 90’s and, according to the Mobility Plan: Accessibility 21 “140.000 car trips are generated per day in the centre of Almada [in 2001] (...) and about 3.500 vehicles cross Centro Sul [rotunda at the entrance of Almada], heading towards Lisbon or Seixal (Museu da Cidade, 2005a). The excess of vehicles in the city centre causes environmental and public space occupation problems, “around 40 percent of vehicles parked in the centre of Almada do it illegally, occupying a total area of about 340,000 m<sup>2</sup>” (Museu da Cidade, 2005a). They are responsible for environmental pollution, excessive noise and traffic congestion. The public space that should be reserved for pedestrians, leisure, green spaces, is deprecated in relation to the space occupied by the various means of transport, including private automobiles.

### 3. The Metro Sul do Tejo (MST)

The project of a light rail transport system that would connect the centre of Almada to Cacilhas and other counties in the south was part of the City Hall strategies to reorder and requalify urban space and improve the environment quality and circulation in Almada (Vasconcelos, 2007). Previously to the MST construction, Almada had only a public bus service: Transportes Sul do Tejo (TST – Transport from South Tagus).

TST provides frequent connections to Almada’s downtown but are less frequent for its surroundings. TST main energetic resource is diesel, and according to *Elac* – Local Strategy for Climatic Alterations (Câmara Municipal de Almada, 2010) – they are responsible, along with private vehicles, for 43 percent of CO<sub>2</sub> emissions.



Fig. 2.

*The Three Lines Initially Projected*

Source: Vasconcelos (2007)

<sup>3</sup> The Functionalism of Louis Sullivan, followed the maxim “Form follows function” and profoundly influenced the architecture and design in Europe until mid-twentieth century.

MST's line construction started in 2006. Three phases of works were planned, connecting the centre of the city to main transportation interfaces, and also creating new interfaces in locations outside the city's centre, serving the populations from Seixal, Moita e Barreiro (See Fig. 1). The first phase, concluded in 2008, corresponds to lines 1, 2 and 3 (See Fig. 2) the benefits of this project, pointed out by the MST/Government studies, were:

- Accessibility improvement to Almada and better connections to Lisbon;
- Mobility improvement for the entire south bank population, better articulation between modal transportation systems;
- Less waste in resources and time of travel;
- Increase of the capacity and quality of public transports;
- More comfort for public transport users (Vasconcelos, 2007).

The same studies estimated a total number of 28 million people being transported in the first years: 90.000 per day in week days. The second and third phases of construction would help to solidify these numbers.



**Fig. 3.**

*First Phase of Implementation*

Source: <http://transportesalmada.ageneal.pt/upload/docs/PDFs/Metro.pdf>

#### 4. Usage of the MST

In spite of its best intentions and good foresight, José Luís Brandão, MST's administrator, stated that user numbers were only 35/40 percent of what was expected in the preliminary studies (Silva, 2010). In 2011 *Agência Lusa* (National Agency for Information) announced that the second and third phases of construction were stopped, and the contract between the State and Consortium would be renegotiated.

This information was released after the MST's Audit Follow-up, held in 2011. Thus, the Court of Auditors Report states that "The MST project does not present evidence to be economically feasible, and the concessionaire itself recognizes that economic viability (...) is not possible without State support." (Tribunal de Contas, 2011).

Amongst the economic unavailability reasons that imply interrupting the network's construction are: (1) the high fraud rate of passengers actually transported – about 25 percent in December 2010. According to the concessionaire, some passengers do not validate tickets because of the existing "open" validation system. The validation machines are inside the trains, many users only validate tickets when control occurs; (2) the network design is not suited to current population needs, since it left out the *Garcia de Orta Hospital* (located on the edge of the central nucleus of the county) and *Almada Fórum*, a shopping centre in Feijó (southern limit of the county), both not served by the MST's. The Concessionaire argues that the project for the network was made in the early 90's, and it was built almost twenty years later, without being upgraded (Tribunal de Contas, 2011); (3) high amounts of compensation paid by the State between 2008 and 2011, that reach to about seven and a half million Euros per year.

Contrasting with the poor results (not conform to the original estimates – See Table 2), studies of satisfaction surveys conducted by MST found that the degree of overall satisfaction with the "new" means of transport stood at 7.70 percent in 2009 and 7.81 percent in 2010. Convenience of vehicles, appearance of the staff of MST, and the reduced travel time are mentioned as positive aspects (Tribunal de Contas, 2011).

**Table 2***Traffic Forecast through 2011 versus Actual Traffic*

|                               | 2008       | 2009       | 2010       | 2011       |
|-------------------------------|------------|------------|------------|------------|
| <b>Minimum Limit</b>          | 16.139.445 | 88.064.228 | 88.228.363 | 88.681.649 |
| <b>Estimated real traffic</b> | 1.889.278  | 24.725.862 | 29.329.763 | 32.261.410 |

Source: Auditoria de Seguimento da Concessionária MST. Tribunal de Contas, 2011, p.10.

Therefore we ask ourselves why, despite the high percentage of user satisfaction with the MST, is traffic volume so small compared to what was originally planned? The estimate of the user numbers was made based on the construction of all MST's lines and not only on the first phase of work. The current line of the MST, serves almost exclusively the centre of the municipality, the area that was already relatively well served by public transport. There are still no efficient solutions for people moving from outside the municipality of Almada (coming from Seixal or Barreiro) to Cacilhas or Lisbon, and tram is not feasible for these users. The private automobile continues, moreover, to increase its share of use and the issue of congestion in accesses to the main city, was only partially resolved.

The use of private transport as the main means of travel, follows a pattern similar to other European countries. During the last twenty years of the twentieth century, Europe witnessed a steady decline in public transport usage, replaced by private transport (European Commission, 2010), a direct effect of the improvement in population's financial conditions and lack of urban development strategies and problems in public transport – poor quality vehicles, inefficiency, unnecessary mandatory walking routes and lack of parking facilities in the vicinity of the stations / bus stops (Vasconcelos, 2007).

Gray designates the reasons for the preference of private transport over public ones, by the acronym SCARCE: Safety, Comfort, Accessibility, Reliability, Cost and Efficiency, stating that the automobile dominates over bus or other public transport because of quickest travel time, freedom from schedules, reliability, protection from weather and security. In Almada, despite its comfortable trams and high frequency of connections, MST could not substitute public transport for people coming from outside the county.

Another goal of MST line was to create better life quality in the town centre. The initial project included the construction of public parking, so people would have a place to park their vehicles outside main streets, and these streets could be safer and more enjoyable for everybody. However, during the construction process, this was not entirely achieved. Owners from the shops in 25th April Street, Afonso Henriques Street and D. Nuno Álvares Pereira Avenue (three main arteries of Almada) demonstrated in 2007 against the lack of security, lack of accessibility for pedestrians and dirtiness caused by the dust from the MST shipyards (Museu da Cidade 2005b).

Restrictions in circulation inside the city centre were pointed out as a cause of Almada's gradual "desertification". An average big number of commercial services closed in the sequence of MST construction, and it seems that people have no reasons to come to Almada. However, according to Trocado (2001), 55 percent of the local population refers Almada as a good place to live, 20 percent has the opinion that Almada has "everything necessary for living" (p. 31).

The author argues that even the negative connotation of peripheral urban spaces (spaces built outside the city centre previously connoted with criminality, for instance) is not correct, since these outskirts of Almada are also "potential places where the demographic growth and the existence of young people represent a positive value, contrasting with central town areas with weak demographics and an aging population" (Trocado, 2001).

Another factor that contributed for the displacement of commerce (and consequently the displacement of people from the city centre) was the construction of a big shopping centre in the outskirts of Almada. The Almada Fórum was inaugurated in September 2002. The building, parking areas and other support areas occupy 110.000 m<sup>2</sup>.

With 260 shops, intended to receive around 18 million people per year, the new shopping centre created 2000 new jobs and its promoters were responsible for the construction of new accesses to the city (bicycle path, petrol station, tunnels and new roads around the shopping) improving the mobility of people in the entry of the city. At the time of construction, local commerce owners demonstrated against it, arguing that this new space "would accentuate the disequilibrium that already existed between local smaller shops" (Azenha, et al., 2002).

As pointed before, this new site was not included in the MST line. People mostly use their private automobiles to visit it; another option is the bus line. The tram takes travellers until Centro Sul and from there it is still 1,5 Km to reach the shopping.

## 5. Hypothesis for the flop

According to the analysis presented, we can conclude that the city of Almada did not always grow in the most appropriate or pleasant way for its inhabitants. In early years of the twentieth century, despite the good intentions of planners and City Hall, the expansion of the city was so chaotic, that caused serious problems of housing in areas where population growth was very strong. This demographic boom created also problems of transport for people used to travel short distances, by bicycle or on foot. Between the 70's and 90's there is a disproportionate increase of pollution levels, noise levels and traffic congestion caused by the excess of private vehicles circulating on the bridge over the Tagus River, and in the entries of Almada. Finally, in the last decade of the twentieth century several public entities attempt to solve this state of things, moving forward with the MST's project, a public transport, fast, quiet and clean, which would also allow more efficient connections to the city of Lisbon.

Despite the impact studies done prior to the completion of the project, and the debate promoted amongst its stakeholders, the MST implementation was always controversial, due to the assumed investment and required territory reorganization. In addition to necessary changes in long-established habits, MST had impacts on city's urban form that have not been fully provided. As stated by Lamas "Today it seems there is already consensus on the misdeeds of functionalism: central areas empty at night and dormitory cities are problems already reported *ad nauseam* and abandoned in the practice of planning" (Lamas, 2004). Almada mirrors itself on this description and contrary to what was expected, the implementation of MST was not able to solve the lack of population during weekends and evenings. The chaos of construction and repeated delays in its completion, has forced many shops to close doors, leaving a main city's artery almost deserted.

We can also argue that the city centre has changed, with the new principal MST stops, where the greater influx of people occurs.

Finally, I further strengthen that the draft that gave rise to the initial impact study and estimates of passenger numbers (very auspicious for the MST) has not been fully met. If the increase in population density leads to more pollution, noise, traffic congestion; the existence of areas farther from the centre also influence the use of private automobile for people who have no viable alternatives. The MST is not an alternative for residents outside the limits of the municipality of Almada, because the 2nd and 3rd phases of work were not completed.

People continue to find easier to use private automobiles and go shopping where it is possible to park just outside the shops, like is the case of Almada Fórum. Even if this massive commercial area brought an increase of jobs offer to Almada, the direct impact on the city's life was not considered, and it would have been of most importance to include a MST stop in this location.

## 6. Conclusions and future work

This paper examines mobility in Almada after the MST implementation. We discussed some hypothesis to explain the fail of this new tramline and its consequences to the city's life. First, the lack of urban planning in Almada created inhospitable areas that were abandoned by its residents – the city centre had already evidences of being "deserted" before MST inauguration; second, the city centre has changed, and this factor was not predicted. Finally, the original project intended to serve Almada and also residents from the surrounding municipalities, but only with the first phase concluded it has fewer users than it was expected.

We plan to continue this research with an empirical study as a way of obtaining concrete numbers about the actual users of MST. This will take place in two phases: (1) with a short enquiry in the main tramline stops, to have a more accurate understanding of who are the "real MST users"; (2) with interviews intended to collect feedback about user experiences (with the tram service, its preeminent touch points, staff, amongst other important issues).

Conclusions from this study will be part of an action plan proposition for MST.

## References

- Azenha, A.S.; Fernandes, D.; Marques, R. 2002. De olhos postos em 20 milhões de clientes. Correio da Manhã, Lisboa. Available from Internet: <http://translate.google.pt/translate?hl=pt-PT&sl=pt&tl=en&u=http%3A%2F%2Fwww.correiodamanha.pt%2Fnoticia.aspx%3Fcontentid%3D00009369-3333-3333-000000009369%26channelid%3D00000009-0000-0000-0000-00000000009&anno=2>
- Bonifácio, A. 2004. *Almada “Waterfront”. Contributos para síntese da evolução do espaço público urbano. Espaço público e regeneração urbana: arte e sociedade*. UN Barcelona, Barcelona.
- Câmara Municipal de Almada (Eds.). 2010. *Estratégia Local Para as Alterações Climáticas do Município de Almada*. Câmara Municipal de Almada, Almada.
- Carvalho, J. 2003. *Ordenar a cidad*. Quarteto Editora, Coimbra.
- European Commission. 2010. EU Energy and Transport in figures. Statistical Pocketbook. Available from Internet: [http://ec.europa.eu/energy/publications/statistics/doc/2010\\_energy\\_transport\\_figures.pdf](http://ec.europa.eu/energy/publications/statistics/doc/2010_energy_transport_figures.pdf)
- Gray, G.E. Perceptions in Public Transportation. Available from internet: [http://ntl.bts.gov/data/letter\\_ak/Chapter22.pdf](http://ntl.bts.gov/data/letter_ak/Chapter22.pdf)
- Lamas, J.M.R.G. 2004. *Morfologia Urbana e Desenho da cidade*. (3rd Ed.). Fundação Calouste Gulbenkian. Fundação para a Ciência e Tecnologia, Porto.
- Museu da Cidade. Câmara Municipal de Almada (Eds.). 2005a. *Mobilidade em Almada. Dossiers de informação*. Centro de Documentação – Museu da Cidade, Almada.
- Museu da Cidade. Câmara Municipal de Almada (Eds.). 2005b. *Transportes em Almada: a evolução dos transportes em Almada. Dossiers de informação*. Centro de Documentação – Museu da Cidade, Almada.
- Silva, R.; Vieira P. 1995. *História do Urbanismo em Almada*. Câmara Municipal de Almada, Almada.
- Silva, N.M. 2010. Concessão do Metro Sul do Tejo vai ser renegociada, in Diário Económico. Available from internet: [http://economico.sapo.pt/noticias/concessao-do-metro-sul-do-tejo-vai-ser-renegociada\\_101955.html](http://economico.sapo.pt/noticias/concessao-do-metro-sul-do-tejo-vai-ser-renegociada_101955.html)
- Rodrigues, J. M. S. 1999. *A expansão programada de Lisboa para a margem Sul: Almada, 1938-1950*. Retrieved from Master Dissertation. Instituto Superior de Ciências do Trabalho e da Empresa, Lisboa.
- Tribunal de Contas (Eds.). 2011. Auditoria de seguimento à concessão Metro Sul do Tejo, Tribunal de Contas, Lisboa Available from internet: [http://www.tcontas.pt/pt/actos/rel\\_auditoria/2011/2s/audit-dgtc-rel022-2011-2s\\_1.shtm](http://www.tcontas.pt/pt/actos/rel_auditoria/2011/2s/audit-dgtc-rel022-2011-2s_1.shtm)
- Trocado, F. 2001. *Modo de especialização social e apropriação quotidiana na cidade de Almada*. Câmara Municipal de Almada – Museu da cidade, Almada.
- Vasconcelos, C. 2007. Projecto Metro Sul do Tejo – 12ª Reunião Intermédia de Comités Técnicos da ALAMYS – Sessão Plenária. Available from internet: [http://www.alamys.org/documentos/CCTT\\_lisboa\\_MAY07/04\\_Metro\\_Transportes\\_do\\_Sul-MTS-Cristina\\_Vasconcelos.pdf](http://www.alamys.org/documentos/CCTT_lisboa_MAY07/04_Metro_Transportes_do_Sul-MTS-Cristina_Vasconcelos.pdf)





# **METRO SUL DO TEJO: SERVICE DESIGN AND USER FEEDBACK**

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With Guillermo Talavera and Miquel Domènech





## Metro sul do tejo: Service design and user feedback

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### ABSTRACT

*Metro Sul do Tejo* (MST) is a public Light rail system operating in Almada, Portugal. The line opened in 2008 with the aim of improving mobility in the city, reducing pollution, noise and traffic congestion, and reducing the use of private transport. The concession contract provided for the payment of compensations (to be paid by the State) if the estimated number of users was not achieved.

After eight years in operation, the service is not economically viable without further support from the State, construction of second and third phases is suspended and the number of service users represents only 45 per cent of the initial estimate.

The main purpose of this paper is to contribute to a better understanding of the causes behind such a low usage rate by analysing the results of a survey carried out among users of the MST. As we will see, the service does not fulfil quality expectations, nor does it satisfy important requirements such as safety and comfort, which are currently a cause for complaints and may prove decisive in increasing service usage and helping modal shift.

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### 1. Introduction

Almada is a Portuguese city situated on the south bank of the River Tagus, facing Lisbon, the capital. Many migrants from other Portuguese regions settled in Almada during the 80's and 90's to work in the cork and boat construction's industries. Meantime the industries ceased labouring, but the number of residents did not stop increasing and reached a total of 174,030 inhabitants (INE, 2011).

In 2010, 22.7 per cent of this population worked and studied outside the municipality (20 per cent workers – 35,003 people, 2.7 per cent students – 4717 people), and used the local transport network or private transportation to commute daily to their job/school (INE, 2011).

57.8 per cent of Almada's inhabitants use their private transportation (auto or motorbike) in daily journeys (47.3 per cent working people, 10.5 students); against 42.2 per cent of residents that use bus, train or boat.

The public transportation network consists of bus lines (*TST*, and *Barraqueiro*), ferry lines (*Transtejo* and *Soflusa*), and train

(*Fertagus*), but like in other European cities its usage has declined in the last years, in contrast with private transportation usage.

In Almada, the bus service (*TST*) is very efficient, but runs sparsely outside the city centre, with low frequency and reduction of service outside rush hours and weekdays. Buses do not operate on dedicated lanes, and are therefore not efficient in days of severe traffic.

The ferry (*Transtejo*) links the two river margins, and provides a fast journey to commuters that live and work near to the river (Cacilhas or Lisbon downtown), but for most people it does not replace other transport (bus, underground or tram in Lisbon).

In 1999, a new train service (*Fertagus*) started to operate on the bridge between Almada and Lisbon. With interfaces in Almada, in other locations inside the Lisbon Metropolitan Area – LMA, and connecting to the Portuguese train network; the principal purpose of *Fertagus* was to reduce time of travel for people commuting to Lisbon, and also reduce the number of private transportation on the bridge (and consequently the carbon dioxide emissions).

Previous to this project, in 1996, the southern municipalities of LMA joined together to discuss a solution for the traffic congestion and designed a light rail project with modal connections into Lisbon, that would serve the residents of Almada, Barreiro, Seixal, and Moita (a total of 477,092 residents in 2011) (INE, 2011).

The project was subject to a procurement process and the first three lines were concluded in September 2008, connecting the municipalities of Almada (civil parishes of Almada, Cacilhas,

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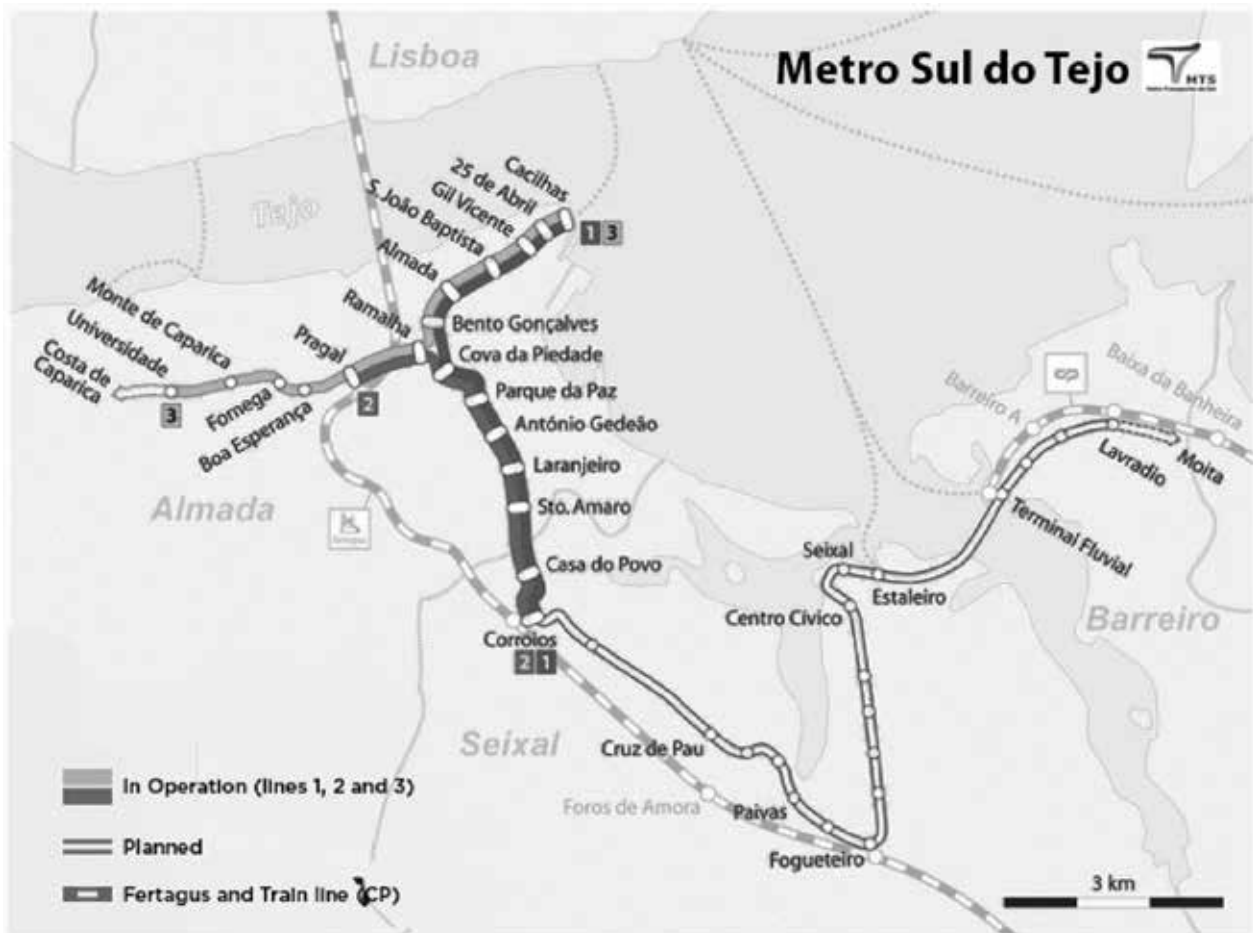


Fig. 1. Metro Sul do Tejo Project.

Source: pt.wikipedia.org

Caparica, Cova da Piedade, Feijó, Laranjeiro and Pragal) to Seixal (civil parish of Corroios) (see Fig. 1).

Initial estimates as to passenger flows pointed to 16,139,445 passengers x km transported (PKT), the first year of the concession – 2008, a number that was expected to increase gradually to 88,681,649 passengers x km in 2011 (MUNICÍPIO DE ALMADA/CÂMARA MUNICIPAL DE ALMADA, 1996). The contract signed between the State and the winning consortium established that compensations were to be paid by the State if estimates were not achieved.

In 2008 real traffic was actually of 1,889,278 passengers/km and in 2011 only 32,261,410 passengers x km (PKT) used the service (approximately 36 per cent of initial estimates); the Portuguese State paid compensations of around 7.5 million Euros per year and ordered an audit to the company. The court of auditors concluded that MST had no economic viability (Tribunal DE CONTAS, 2011) without State support, and second and third construction phases were suspended (Lopes, 2011).

This paper reports the findings from a survey and series of focus group that were held during research, its aim is to gain insight into the perceptions of users regarding service design, in order to investigate the extent to which any possible design problems may affect the use of the service and explain its low rate of usage.

The work will focus on the quality requirements of a public transport that make it attractive for its users and encourage modal shift: if it does not provide a positive experience, or if interface

points are difficult to use, users may feel uncomfortable or unsafe and restrain service usage.

The paper is organised as follows. Section 2 reports reasons of choice and success of light rail in different European cities. Case Study is presented in Section 4, with Discussion of the empirical study's findings in section 5. Section 6 concludes the document.

## 2. Literature review: light rail reasons of success

Urban design is today inherently linked to integrated public transportation systems (Sarmiento, 2016), that include “adaptive services, modern infrastructure, traffic management tools, awareness campaigns, well coordinated mobility schemes, and advanced ITS solutions” (Tyrimopoulos and Antoniu, 2013, p. 36), and contribute to a better quality of life in cities, reducing the use of private transportation, creating a healthier and safer environment.

In the last decades, modern public transport solutions privileged the construction of light rail systems in detriment of bus lines. Benefits of light rail when compared with bus, have been largely discussed by researchers (Van Der Bijl and Van Oort, 2014; Mackett and Sutcliffe, 2003; Lee and Senior, 2013; Olesen, 2014), and studies report that users most willingly pay for a “quick and frequent rail service, than for other urban modes” (Akiva and Morikawa, 2002, p. 110; Milena and Katrin, 2012), light rail systems are considered superior to bus: more modern, friendlier, and more accessible.

Pursuing this trend, several European<sup>1</sup> countries have implemented successful light rail systems, in the effort to modernize their public transportation network. This is especially evident in France, Germany, and Switzerland, countries that stand out for the good solutions applied in what concerns public transportation services (Olesen, 2014; Bottoms, 2016; Buisson, 2012).

France has today 57 operating tramlines. A large effort was made in the modernization of tram services, after World War II, and the country is known by its long lines (e.g. Bordeaux – approximately 236,000 inhabitants, with 3 lines of 80 km); electric-powered lines (like in Clermont-Ferrand, that has around 140,000 inhabitants, with a guided central rail tram); systems with rubber tires, like in Nancy (approximately 105,000 inhabitants) with trams on electric and diesel traction; Strasbourg (272,000 inhabitants) with *Company des Transports Strasbourgeois* – CTS that operates 6 lines, on a total of 40 km – the lines construction started in 1994 and had an increased ridership by 43 per cent only 3 years after operation started.

Between old, renovated or new lines, coordinating with other public transport services (train, trolley-bus, underground and bus), Germany has 56 different tram services operating in different cities: “roughly 88 per cent of Germans live within a kilometre of a transit stop” (Eric, 2012).

Switzerland is also a reference in Europe with ZVV Zurich – that has transported 1.3 million passengers/day in 2014, and Bernmobil in Bern – that has been renewed and extended: 27.5 km and 5 lines, with 21,000 passengers/day (Olesen, 2014).

In the reasons of success of these tram services, several common factors were identified (Babalik, 2000; VOV UTP, 2015; Graham et al., 2011; Edwards and Mackett, 1996; Semaly and Maunsell, 2003). Researchers report:

a) **External factors**, which include physical characteristics of urban areas (location of employment, residential density); socio economic characteristics from the city where the system is integrated; transport policies and urban planning policies. *Transport policies* refer to regional service integration, stations localisation, bus service integration); *urban planning policies*, consider the adaptation of new systems, encouraging joint development projects, pedestrianizing streets, encouraging city centre redevelopment, and urban renewal projects (Mackett and Sutcliffe, 2003; Crampton, 2002).

Direct democracy is also a mentioned factor for Switzerland: important projects are voted at Federal, Cantonal and Communal level, directly involving the population.

In the majority of studied cases an intensive urban rearrangement took place while the lines were modernised. Nice, (France) is an example of these good practices: artwork has been placed in and around tramlines. Large sculpture and personalized sound announcements in different stations enhanced the city centre, where only trams without wires travel today (Crampton, 2002).

b) **Internal factors** refer to route location (more successful systems serve areas of urban growth, or encourage development along the line), cost (project, and posterior costs, fares, advertising marketing campaigns), service frequency, travel cards, staff on board and on stations (service quality characteristics).

Quality and extension of the services are also determinant factors, with full regional and intermodal coordination – short journey times, routes, schedules, common fare system, cross-platform interchanges, *Park&Ride* including bikes (Buisson, 2012; Eric, 2012); segregated lines and traffic lights priority; high-capacity vehicles with full accessibility (Grenoble, France, was the

first system to implement low-floor vehicles and corresponding platforms at all stops).

In what concern fares, low-cost ticket options make tramlines more attractive than private car (Eric, 2012). In Germany the transit authorities proposed discounts to children, the elderly, and students (Eric, 2012). In Switzerland an open system allows single tickets, valid in all the available transport in the same area. The country is also known by the high number of regular subscriptions sold every year “Over half of all Swiss adults have a half-fare travel card, a full-fare travel card or a regional network travel pass – 2.3 million half-fare travel cards, 440,000 full-fare travel cards and 1.3 million regional network travel passes were being used at the end of 2013” (VOV UTP, 2015, p. 12).

The mentioned factors justify for the success of the identified lines, and will help to sustain the conclusions from the case study MST, which is presented in the next sections of this paper.

### 3. Methodology

To better understand the perceptions and behaviour of MST users and therefore draw conclusions about how the service is used, the authors conducted an empirical study consisting of two different intercept surveys and focus group sessions.

#### 3.1. Questionnaires

For the first questionnaire, 200 people (110 female and 90 male) were contacted between November 2012 and March 2013, in different tram stations of the network, at different hours of the day, during weekdays. The questionnaire had a convenient/voluntary sample, where “elements are chosen because they are where study data is being gathered – participation is accidental or voluntary” (Isla, 2012).

MTS users were asked to answer a short questionnaire aimed at collecting general demographic data (**user information, age, gender**) and – on a basis level – why and how people use the MST (**origin–destination, frequency of use and reasons for usage**). During the first month of data collection we observed that not all the stations were equally attended. Interface stations had normally more users, dependent on the hours of the day.

The stations where more data was collected were *Praça S. João Baptista*, *Pragal* and *Cova da Piedade* (see Fig. 1). *Praça S. João Baptista* is located in the centre of Almada, near two schools and services. A large amount of users start or finish their journeys in this square, and we observed a big affluence of people in the early morning and after 17 h. Between these hours the station is less frequented and the frequency of trams also declines.

*Pragal* is the interface with Fertagus (train on the bridge) and is therefore used by people moving from Almada to Lisbon, and also by students that connect from Lisbon to *Universidade*, the end of the line where a university is located. We observed a high usage during rush hours, but also at lunch hours (period between 12h00 and 14h00).

*Cova da Piedade* is a secondary interface station, and it is a connection point for bus users (bus to other Portuguese cities – *Rede Expressos*, Lisbon – *Carris*, and local buses – *TST*); parking facilities exist in the vicinity. This tram stop had a high frequency of use during mornings and afternoons (after 17h00). After lunchtime a high percentage of people waiting for the tram was also observed (between 13h00 and 16h00), and this can be explained by the low frequency of trams at these hours (20 min, sometimes more between tram).

In general people answered willingly to the questionnaire, although intercept surveys were made outdoors – tram stops are open structures –, the weather conditions were never a problem for the interviewer or interviewed, because the intercept surveys

<sup>1</sup> In this literature review only European tramline services were considered, because they are closer to the case in study (in what concerns demographics, policies, concept idea, etc.).

duration – five minutes maximum, allowed people to answer between connections.

The second questionnaire was built using SERVQUAL' five generic factors for measuring service quality (Buttle, 1995; Parasuraman et al., 1988; Shanin, 2016; Lynn Shostack, 1984). These factors include **physical (tangible) aspects** like tram stations, information panels, ticket machines, frequency of trams, accessibility and fares; and **perceived or intangible factors** such as comfort, noise, temperature on board, driver performance, and personnel behaviour (Moritz, 2005). This questionnaire was created online using *mailchimp*, and sent by mail to respondents that answered the first questionnaire and belonged to the principal demographic groups. The survey was conducted during April/May 2013 and 32 valid answers were received.

### 3.2. Focus group

Focus group's sessions allow the researcher to interact directly with the respondents, creating an opportunity for people with different backgrounds to express their perspectives on the topic being researched (Stewart et al., 1990). This was considered an adequate instrument to deepen the previously obtained information and commentaries.

Two focus group sessions were held in the Public Library of Almada. The sessions were conducted by the author and had the presence of frequent and infrequent service users (8 people in each session), with the average duration of 60 min. The frequent users were chosen amongst the people interviewed in the first phase of the research (questionnaires); the infrequent users were acquaintance from the author or from other participants.

Three males and five females participated in the first focus group (three frequent users of PT) conducted in 15th March 2014, whereas in the second session, held on 22nd March 2014, genders were equally represented (six frequent public transport users).

Both sessions were recorded, posteriorly transcript, and consisted of 10 questions, starting with more general topics

(about people's living location; opinions about public and private transport) to more focused topics, directly related with MST and the way people use or do not use the service.

## 4. Case study results

This section reports the findings from the questionnaire and focus groups; in both instruments participants were allowed to express their ideas or evaluate the service.

### 4.1. Participants' demographic profile – survey 1

32.5 per cent of respondents were students aged 16–25 and 26 per cent were elderly people, mostly retired, aged 65 and over. The third most represented group of users (15.5 per cent) were workers aged between 36 and 45.

The majority of respondents (69.5 per cent) were frequent users who used the service every weekday; main reasons stated for using the MST were: **travel to/from work** (35.5 per cent) and **travel to/from school** (27 per cent). Twenty-seven per cent of respondents did not have any specific reason for using MTS and 14.5 per cent used the service for **leisure purposes**.

The majority of respondents live and were heading to destinations inside the county; Feijó, Laranjeiro and Cova da Piedade are localities in the municipality of Almada (see Fig. 2).

Only 4.5 per cent of respondents came from Lisbon and other unidentified locations on the north bank of the Tagus; 4.5 per cent lived in Seixal, (the neighbouring municipality), Corroios and Setúbal (the district capital from Almada). The majority of respondents live in Almada Centre (28.5 per cent) or in places that belong to the county – Cova da Piedade, Feijó, Laranjeiro, and Costa da Caparica (see Fig. 3).

The centre of Almada was the destination of 63.5 per cent of users. 17.5 per cent of users' destination was places inside the county of Almada (Cova da Piedade, Feijó, Laranjeiro, Costa de



Fig. 2. Map of Almada.

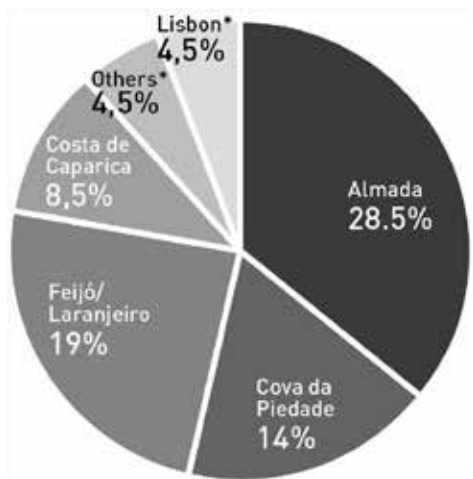


Fig. 3. User's residence place.

\*Others: includes locals of residence outside the county of Almada, like Seixal, Corroios, and Setúbal.

\*Lisbon: includes other locations in the northern margin of Tagus River.

Caparica, and Trafaria). 13 per cent of users were headed to Lisbon (see Fig. 4).

Origin/destination: line 1 (see Fig. 5), is the most used, 64.5 per cent of respondents mentioned stops in Line 1. This line is the longest one from the network (with 13.54 Km), and its end stations are important interface points with the ferry (Cacilhas), and with the train (Corroios).

Results showed that Line 2 is the less used, with only 11.5 per cent of respondents moving between Corroios and Pragal.

25 per cent of respondents travelled frequently in line 3, but from these the majority used MST between Almada and Pragal, only 15 people travelled from Almada with Universidade as destination.

#### 4.2. Second questionnaire's results

Five main themes were defined during the questionnaire phase (and posteriorly discussed in the focus groups):

##### a) Interaction with the physical (tangible) points of the service (ticket machines, tram stops)

Gatherings from the second questionnaire showed that 43 per cent of interviewed people purchased their tickets on MST's ticket

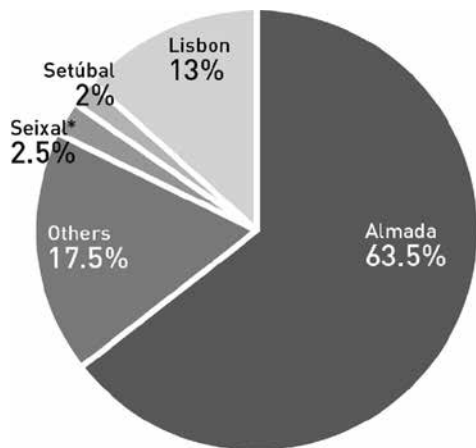


Fig. 4. Place of destination.

\*Seixal: includes other destinations inside the county of Seixal, like Corroios.

machines (the remaining 47 per cent used MST's selling points); parameters evaluated in the ticket machines were: **clear instructions, accessibility, screen lighting, time spent, different ticket options, payment options, and usability.**

Information provided by MST in tram stops, was evaluated as Good by 43 per cent of respondents (**digital and printed panels placed correctly, clear language**), and **information update** was considered Reasonable.

##### b) Service provided by the MST's employees

The performance from MST's employees and their ability to deal with users' requests was highly criticized.

Respondents considered Reasonable (Average) efficiency, friendliness and questions understanding from the employees, but attributed a score of Very Bad to competence, behaviour, and education/training in contact with the public.

MST's ticket controllers received scores of Very Bad on **visual aspect and education.**

##### c) Safety in the tram stations and inside trams

56 per cent of people rated as Very important: **safe and competent conductors, and safety against crimes at tram stops.**

The results from the second questionnaire reinforced the dissatisfaction with safety against crimes in tram stops – majority of respondents was Very Unsatisfied with the security conditions provided by the service.

##### d) Impact of MST on the city's life (problems, benefits)

For the majority of participants, MST had definitely a high impact on the life of the city (not yet entirely measurable), expressed in urban, transportation and social terms.

Participants agreed that the use of public transportation impact on the regulation of traffic inside Almada, specifically after implementation of the MST. Squares and streets became friendlier for pedestrians and other soft mobility.

As a conclusion of the empirical study, respondents evaluated the Journey provided by MST with an average classification of Good.

Along with the five factors mentioned before, other questions like **frequency/waiting time between trams** (which did not exceed 12 min), **comfort and temperature inside trams, timetable information** were considered Good or Reasonable.

Fifty-two per cent of respondents rated as Very important: accessibility for people with special needs in trams and tram stops, reliable trams that arrive on schedule, delay information and announcement, and short waiting periods in tram stops.

69 per cent of respondents considered Good the comfort inside trams; 52 per cent mentioned that tram cleanliness was Good, and 39 per cent of respondents considered Good the journey duration. Noise inside trams was considered problematic, with 34 per cent of questionnaire's participants reporting it as on the limit of Reasonable. In general there were no negative evaluations about the aspects considered determinant for the journey.

#### 4.3. Focus groups' results

The opinions expressed by participants from Focus groups reinforced findings from the qualitative data.

##### a) Interaction with the service (tangible points)

Participants from the focus groups expressed concerns about the machines' bad maintenance and malfunction caused by vandalism that prevents its efficient usage. It was referred that maintenance is not done with the necessary frequency; and the focus groups' participants sustained this opinion: "[ticket machines] should be checked more often, because they are quickly full of coins and that prevents customers from buying tickets". (Focus group 1)

A high number of respondents had or knew about other people's bad experiences in buying tickets to use the tram. This was



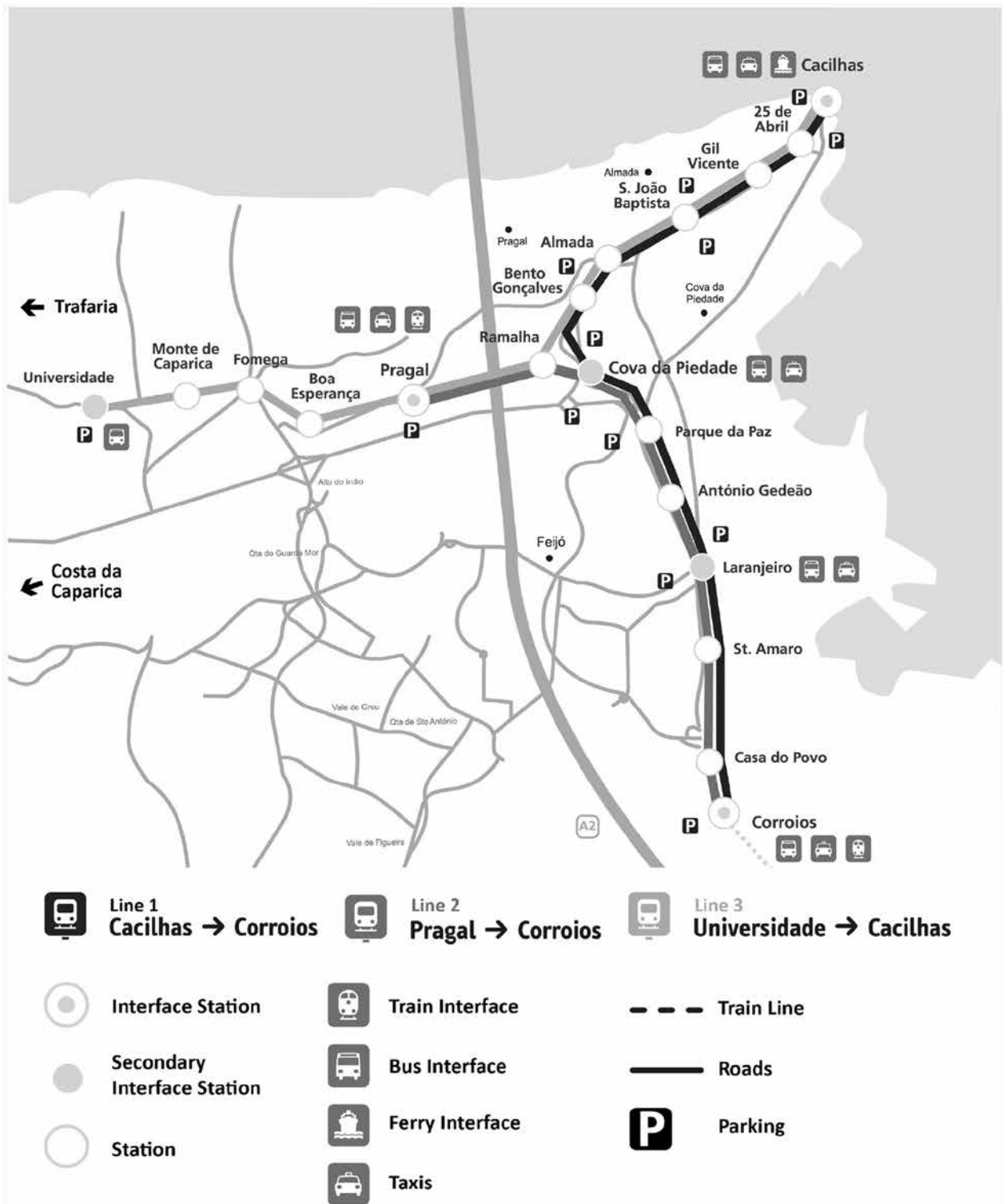


Fig. 5. Metro Sul do Tejo Network.

Source: <http://www.m-almada.pt/>

also possible to observe, during the questionnaires period; some users were not able to buy their tickets or pay it like they intended. “Often when I try to buy a ticket, the machine does not work, sometimes it does not give change, or I cannot get the ticket.” (Focus group 1)

“When I cannot buy a ticket and I am controlled during the journey, I will get a fine of 85 euros.” ((Focus group 2)

Another cause of bad interaction experiences was the tram stop shelters. Factors evaluated were: safety, comfort, protection against weather, cleanliness, information displayed, number of

seated places available, number of ticket vending machines, and accessibility.

Safety in the facilities is reported as Very Poor (by 30 per cent of respondents). The lack of safety/surveillance and the absence of security cameras that could help to prevent problems in more isolated tram stops were the most reported factors. Protection against weather provided by tram shelters is also reported as Bad (39 per cent of participants agreed on this issue). Hygiene conditions of the tram stops was mentioned often and considered only reasonable by 56 per cent of participants. These topics were mentioned and discussed during the focus groups:

“90 per cent of tram stops in Almada, Cacilhas and Corroios are not able to protect people against the sun, rain or cold weather, and that means they are good for nothing.” (Focus group 2)

“I understand that enclosed shelters, such as the ones we used to see before, where all kinds of people can smoke and sleep in, are not convenient. However, having something beautiful but useless is also stupid.” (Focus group 1)

“The number of seats provided inside the shelters is not enough; some seats are too high and some are too low, my feet do not touch the floor or the opposite. They are not at all comfortable.” (Focus group 1)

“We see garbage everywhere. The lines are not regularly cleaned, the grass is not trimmed.” (Focus group 1)

**b) Employees**

Focus groups’ participants mentioned that ticket controllers “have no competence and do not behave adequately with customers” (focus group 2) – see Fig. 6.

Also criticized was the behaviour of employees and especially of ticket controllers towards users of the MST.

“They are very aggressive with people. They enter trains outside the main stations. I saw how the tram stops between stations so controllers go inside and catch passengers travelling without a ticket.” (Focus group 2)

“I think the problem is that many people do not pay their tickets. The company loses large amounts of money. The government asked for a more efficient system and then controllers started to work, but they did not receive training on how to interact with the public.” (Focus group 2)

“I think this is certainly an aspect to improve. Controllers are not very friendly, but they have no reason to behave like this.” (Focus group 1)

**c) Safety**

People reported situations that made them feel unsafe: “I witnessed an assault and was once harassed by people in a tram stop. It happened in the evening and there was no surveillance nearby”;

“A woman was assaulted at the tram stop”; “I often saw people smoking drugs inside the tram”. (Focus group 2)

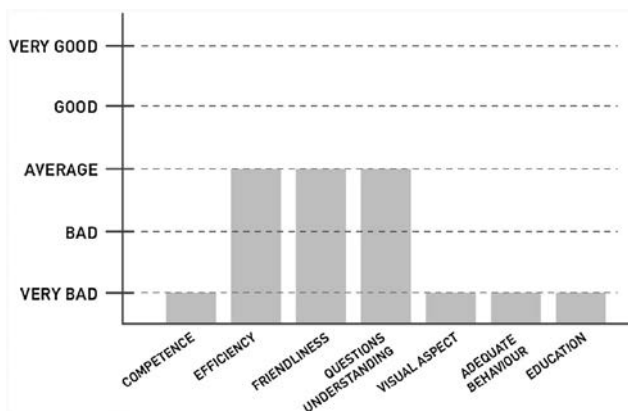


Fig. 6. MST tickets’ controller evaluation.

The lack of security outside trams was also referred, and one of the disadvantages of a surface line. People considered that the new tramline compromises security in main roads:

“Before the existence of the tramline, separation between road and sidewalks was clear. I used to tell my children where they could cross the road and where they should not do it. Today is not that simple”. (Focus group 1)

“There are no obstacles between the line and the sidewalks, or bus stops. Inside the city centre the problem is worse: there is not much space for the tramline”. (Focus group 1)

Perceptions are that an underground line would have been safer for transport users and also more convenient for private car travellers:

“I think that, like other services it should be underground. On the surface is more dangerous, not only all traffic on main roads was restricted, but also the noise in the city was incremented”. (Focus group 1)

“Carriages and lines are getting degraded. The trams go ‘out’ of the lines and accidents happen because they run at more than 50 km/hour”. (Focus group 2)

**d) Impact of the service on the city’s life**

According to the focus groups’ participants, MST service not only allowed traffic to become more fluid, but also diminished it in the city centre, impacting on the air quality: “Today we have different demands regarding environment, we need non-pollutant transportation such as the MST.” (Focus group 2)

“It is a more environmentally friendly mode of transport.” (Focus group 2)

Participants from the sessions agreed that MST had a positive impact in Almada. Benefits mentioned were: **efficiency, comfort, price and social interaction.**

The tram has a good frequency and easily reaches all the places in the line: “The tram is comfortable, carriages are always clean, it is fast and efficient.” (Focus group 2)

Ticket prices are affordable and cheaper when compared with other transportation: “The tram is cheaper than the bus. MST made the prices from bus stay low. If it was not for MST we would have the double of pricing for buses.” (Focus group 2)

People mentioned MST as a place where personal interactions take place: “In my opinion MST provides a social perspective. People that move in their private autos do not talk to each other. I like to go somewhere by tram, and sometimes find people that live nearby. People with whom I would otherwise had no contact.” (Focus group 1)

One not so positive consequence was the increase of real estate prices, in the city centre. Apartments became more expensive in areas near the tramline, cheaper in more degraded or distant areas. This prevents young people from living in the centre, contributing for the existence of an already aged population “The main problem in Almada is that the population is very old and many houses are closed. People have no money to rent or buy apartments here”. (Focus group 2)

**e) Integration of MST line with other transportation in Almada and Lisbon**

Almada is a city with employment mainly in tertiary sector, and even if many people live and work in the city and outskirts, the majority of its inhabitants work or study in Lisbon. MST serves a population in transit (from/to other destinations outside the town), and it was expectable to have a good integration with the transportation network. However, participants complained about the lack of coordination between different public transportation services, “it would be very useful if Fertagus [train on the bridge] and MST could better coordinate their timetables. Sometimes, because of 1 minute we lose the connection and have to wait another 20 minutes for the next train”. (Focus group 2)

Tickets are considered “cheap” when comparing with other transportation; MST’s cards cost 0.50 cents, they use a

rechargeable technology, and are valid for one year. Single-journey tickets cost 0.85 cents and a 10-journey ticket costs 7.50 Euros.

Monthly tickets cost 18.00 Euros, or half price (9.00 euros) if the customer has a monthly pass from another public transport, with an interface in the MST's line.

The five themes referred in the second questionnaire and focus groups provided an insight of how the users perceive the service, and what are for them the main problems with MST.

Ticket selling machines and MST's employees are aspects of the service with which users directly interact, and are therefore very important to build perceptions of quality and integrity of the service. Solving the mentioned problems depend on the company's action – ticket selling machines frequent maintenance, ticket controller's integration and training –, and are also (apparently) easier to solve than other more subjective aspects like safety, impact of the service in the city life, and integration of MST with other transportation services in Almada.

## 5. Discussion

Evidence from the qualitative research reported in this paper, indicate that even if MST's service is in general perceived as Good, some tangible and intangible aspects of the service could be improved and influence adoption:

### 5.1. Comfort of tram stops

Respondent's answers indicate a high level of dissatisfaction with tram stops, which are not considered safe or efficient in protection against the weather. Their "bad designed" structure (completely open on one side, with a narrow cover) does not prevent people from getting wet when it rains. Tram stops are made of glass, also not comfortable in high temperature days (that are frequent in Portugal). Most respondents considered that these stops were built with aesthetical instead of functional concerns.

Studies report that non-transit riders prefer more aesthetically pleasing transportation shelters, while for transit riders protection against weather and comfort are important issues, even more when transports are not frequent. Improving bus shelters is "an effective way of attracting infrequent or choice riders" (Zhang, 2012, p. 16).

According to Nikolopoulou et al. (Nikolopoulou et al., 2011) thermal comfort inside shelters (ambient temperatures and prevention against wind, rain or sun) is another key issue that effect on the number of users. In Almada temperatures can vary between 30° C in summer and –2° C in winter. The shelters on the tramline are open and do not protect from cold temperatures or wind, but are also not effective on hot days; they do not provide enough sun protection.

Tan et al. (Wang and Bian, 2007) defend that "seating is one of the most fundamental components of a bus stop." Number of seats should match the average number of people occupying the stop. MST's stops do not respect this parameter. Tram stops have all the same size, even in areas where more commuters use them. Shelters have 8 to 10 seats, but in peak hours more than half of the users stand waiting for the tram. Nikolopoulou et al. (Nikolopoulou et al., 2011) advises the integration of transportation shelters in the environment, creating more places for people to seat in the adjacent shelter areas while waiting for the transport; these seats could also be used by other walkers in their day-to-day activities.

It is the authors' opinion that integrating seated areas in the tram environment, without directly changing tram stops, could be a good and affordable solution for frequented stations. Integrating trees or other vegetation in the vicinity of some stations to provide protection against sun, is also a costless solution, possible to be implemented in some places along the line.

Other more profound alterations at the tram stops – enlarging covers, changing materials – should have been tested in the pre-construction phase; these are structural solutions, probably not possible to implement only after eight years of MST's activity.

### 5.2. Ticket selling machines usability

Ticket machines do not work properly, and were not considered reliable. People complained that the machines are not frequently checked; users feel less in control about their journey, because problems often happen during the process of buying tickets.

Vandalism of the ticket selling machines would be minimized with security or cameras at the tram stops, a solution that could act as a deterrent, but that would not solve the infrequent checking of the machines.

A good solution would be to allow users to charge their transport cards using ATM or home banking, this would minimize the use of ticket-selling machines and frequency of maintenance.

Another option could be the implementation of an *eTicketing* system, using *Near Field Communication* (NFC), with personal smartphones.

Different studies report the interest for this kind of solution in transportation (Burke, 2016; Markus and Margareta, 2008; Badger, 2013; Science and Technology Options Assessments, 2014; Anon, 2014). With this technology, payments are made by deduction from pre-paid mobile accounts, direct debit or credit card. The option is already provided by some public transportation services in USA and Europe (Boston, Los Angeles, Sand Diego, Frankfurt, Oslo, Zagreb, Nice, London).

Mobile ticketing relies on equipment that riders own – their personal smartphones – and could be used as an electronic ticket checked on the transportation. Users can other download an app and use it to function as a print-of-sale terminal or, if the transport is equipped with a device that has a NFC antenna, use the smartphone as a contactless payment card (airports already use this technology for checking boarding passes).

Studies (Iseki et al., 2008; Stroth et al., 2007) remark that if this solution initially increases costs for operators (new technology, apps development) and only work if possible stakeholders "agree on institutional and governance issues, such as the identification of leading institutions, revenue distribution models and incentives for participation" (Badger, 2013, p. 48); it would reduce fraud, and could "improve the user experience by setting up tailor-made services for individual passengers" (Badger, 2013). In the MST network it will most certainly minimize the use of ticket selling machines, reducing waiting times and providing a smoother journey for everybody.

### 5.3. Integration of MST's line in the transportation network

MST is "outside" the transport network in Almada, this means that to complete a journey within the MST's line, users needed one dedicated card, or a monthly pass for the network. Recently MST integrated the service in a system used by other services in Lisbon: *Zapping*. This system consists of a chargeable transportation card, where money is converted in journeys usable inside the transportation network (bus, underground, ferry and train).

Users can charge a minimum of 3 euro and a maximum of 20, directly on the ticket selling machines, using bankcards or money. When checking the card inside trams, buses, trains, etc., the ticket price is deducted. This solution has certainly improved the interaction with MST and the accessibility to the service, but did not solve the lack of coordination between services' fares and timetables. Ticket prices are different inside the transportation network in Almada, and bus and tram routes overlap unnecessarily. Bus and tram is not interchangeable, people changing from one

but would eventually help to engage new users and keep current ones.

It is the authors' intention to further develop this work in order to understand how the service provided by MST can be more participative and engaging and how the project could have benefited, from the very beginning, from a participatory approach that may still help to promote loyalty and increase the number of service's users.

## References

- Akiva, Ben, Morikawa, 2002. Preferences by Travel Using a Metro System. .
- Anon, 2014. Smartphone Applications in Transit Services. Growing Popularity. (Viewed November 1st in <http://www.globalmasstransit.net/archive.php?id=16210>).
- Babalik, 2000. Urban Rail Systems: A Planning Framework to Increase Their Success. (Thesis submitted to the University of London for the Degree of PhD).
- Badger, Emily, 2013. Finally: A Transit Ticket on Your Smart Phone. Boston's Commuter Rail Embraces the Next Big Convenience in Mass Transit. (Viewed November 15th in <http://www.citylab.com/commute/2013/01/finally-transit-ticket-your-smart-phone/4414/>).
- Bottoms, Glen D., 2016. Continuing development in light rail transit in western europe. UK, France, Spain, Portugal and Italy. Transportation Research Circular E-C058: 9th Natural Light Rail Conference..
- Buisson, Christian, 2012. French tramway revival key factors of success. APTA-TRB 12th National Light Rail Conference, Salt Lake City, November 2012 (Viewed June 22th 2016 in <http://onlinepubs.trb.org/onlinepubs/conferences/2012/LRT/CBuisson.pdf>).
- Burke, Simon, 2016. Near Field Communication in Smartphones. (Viewed November 10th in [https://www.snet.tu-berlin.de/fileadmin/fg220/courses/WS1112/snet-project/nfc-insmart\\_phones\\_burkard.pdf](https://www.snet.tu-berlin.de/fileadmin/fg220/courses/WS1112/snet-project/nfc-insmart_phones_burkard.pdf)).
- Buttle, Francis, 1995. SERVQUAL: review, critique, research agenda. Eur. J. Market. 30 (1), 8–32.
- Crampton, Graham, 2002. International Comparison of Urban Light Rail Systems: the roles of integrated ticketing, pedestrianisation, and population density. ERS2002 Conference, Dortmund, August 27th, 2002.
- Edwards, Marion, Macket, Roger L., 1996. Developing new urban public transport systems. Irrational Decision-Making Process Transp. Policy Vol. 3 (4), 225–239.
- Eric, Jaffe, 2012. 5 Reasons Germans Ride 5 Times More Mass Transit Than Americans Restrictions on Driving Is the Biggest Factor, Experts Argue in a New Study. (Oct, 5, 2012. Viewed June 20th 2016 in <http://www.citylab.com/commute/2012/10/5-reasons-germans-ride-5-times-more-transit-americans/3510>).
- Graham, Currie, Aoife, Ahern, Alexa, Delbosc, 2011. Exploring the drivers of light rail ridership: an empirical route level analysis of selected Australian, North American and European systems. Transportation 38 (3), 545–560.
- INE, 2011. Censu Da População De Lisboa. .
- Iseki, H., Demisch, A., Taylor, B.D., Yoh, A.C., 2008. Evaluating the Costs and Benefits of Transit Smart Cards. California PATH Program, Institute of Transportations Studies at University of California (Viewed November 10th in <http://www.its.berkeley.edu/sites/default/files/publications/UCB/2008/PRR/UCB-ITS-PRR-2008-14.pdf>).
- Isla, 2012. Investigação Em Marketing Curso De Mestrado Em Marketing. ISLA, Lisbon.
- Lee, S.S., Senior, M.L., 2013. Do light rail services discourage car ownership and use? Evidence from census data for four English cities. J. Transp. Geogr. 29, 11–23.
- Lopes, Dírca, 2011. Metro Sul Do Tejo Com 60% De Passageiros Abaixo Do Previsto. DiPES, Diário Económico (November).
- Lynn Shostack, G., 1984. SERVQUAL and Model of Service in Harvard Business Review 84115. , pp. 133–139.
- MUNICÍPIO DE ALMADA/CÂMARA MUNICIPAL DE ALMADA, 1996. Ante Projecto Para O Metropolitano Ligeiro Da Margem Sul Do Tejo. .
- Mackett, Roger, Sutcliffe, Ela Babalik, 2003. New urban rail systems: a policy-based technique to make them more successful. J. Transp. Geogr. 11, 151–164.
- Markus, Felleson, Margareta, Friman, 2008. Perceived satisfaction with public transport service in nine european cities. J. Transp. Res. Forum 47 (3) .
- Milena, Scherer, Katrin, Dziekan, 2012. Bus or rail: an approach to explain the psychological rail factor in. J. Public Transp. 15 (1) (2012).
- Moritz, Stefan, 2005. Service Design. Practical Access to an Evolving Field. KISD-Köln International School of Service Design. (Viewed April 27th 2013, in [http://stefanmoritz.com/\\_files/Practical%20Access%20to%20Service%20Design.pdf](http://stefanmoritz.com/_files/Practical%20Access%20to%20Service%20Design.pdf)).
- Nikolopoulou, M.K., Linden, J.P.F., Lykoudis, S., 2011. Pedestrians' perception of environmental stimuli through field surveys: focus on particulate pollution. Science the Total Environment 409 (13), 2493–2502 (Viewed October 30th 2015 in <http://www.researchgate.net/publication/51051133>).
- Olesen, Mette, 2014. Framing light rail projects—case studies from Bergen, Angers and Bern. Case Stud. Transp. Policy 2, 10–19.
- Parasuraman, A., Zeithaml Valarie, A., Berry Leonard, L., 1988. SERVQUAL: a multiple item scale for measuring consumer perceptions of service quality. Journal of Retailing 64 (1), 12–40.
- Sarmiento, Claudio, 2016. People-oriented Cities: Three Keys to Quality Public Transport. Viewed May 20th in [www.thecityfix.com](http://www.thecityfix.com).
- Science and Technology Options Assessments, 2014. Integrated Urban e-ticketing for Public Transport and Touristic Sites. European Parliamentary Research Service Viewed November 1st in [http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/513551IPOL\\_JOIN\\_ET\(2014\)513551\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/513551IPOL_JOIN_ET(2014)513551_EN.pdf).
- Semaly, Maunsell, Faber, 2003. Comparative Performance Data from French Tramways Systems Final Report. South Yorkshire Passenger Transport Executive.
- Shanin, Arash, 2016. SERVQUAL and Model of Service Quality Gaps: a Framework of Determining and Prioritizing Critical Factors in Delivering Quality Services. Department of management, University of Isfahan, Iran.
- Stewart, David W., Shamdasani, Prem N., Rook, Dennis, 1990. Focus Groups: Theory and Practice (Applied Social Research Methods). SAGE Publications, Inc, England.
- Stroh, S., Schneiderbauer, D., Amling, S., Kreft, C., 2007. Next Generation eTicketing. Booz Allen Hamilton GmbH, Germany, Germany.
- Taylor, Brian D., Iseki, Hiroyuki, Miller, Mark A., Smart, Michael, 2007. Thinking Outside the Bus. Understanding User Perceptions of Waiting and Transferring in Order to Increase Transit Use. USA.
- Tribunal DE CONTAS, 2011. Metro Sul Do Tejo Auditoria De Seguimento. Relatório n.º 22/2011-2.ª Secção, Lisbon (September 2011).
- Tyrinopoulos, Yannis, Antoniu, Constantinos, 2013. Factors affecting modal choice in Urban Mobility. Eur. Transp. Res. Rev. 5, 27–39.
- VOV UTP, 2015. Facts and Arguments in Favour of Swiss Public Transport 2014/2015. (Viewed June 22th 2016 in [www.voev.ch](http://www.voev.ch)).
- Van Der Bijl, Rob, Van Oort, Niels, 2014. Light Rail Explained. Better Public Transport & More Than Public Transport. EMTA (European Metropolitan Transport Authorities), Amsterdam.
- Wang, D. Tang, Bian, J., 2007. Research on methods of assessing pedestrian level. of service for sidewalk. Journal of Transportation Systems Engineering and Information Technology 7 (5), 5–10.
- Zhang, Kevin Jingyi, 2012. Bus station urban design. nine techniques for enhancing bus stops and neighbourhoods and their application in metro Vancouver. Thesis for the Master Degree of Arts. University of British Columbia.

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## References

- Akiva, Ben, Morikawa, 2002. Preferences by Travel Using a Metro System. .
- Anon, 2014. Smartphone Applications in Transit Services. Growing Popularity. (Viewed November 1st in <http://www.globalmasstransit.net/archive.php?id=16210>).
- Babalik, 2000. Urban Rail Systems: A Planning Framework to Increase Their Success. (Thesis submitted to the University of London for the Degree of PhD).
- Badger, Emily, 2013. Finally: A Transit Ticket on Your Smart Phone. Boston's Commuter Rail Embraces the Next Big Convenience in Mass Transit. (Viewed November 15th in <http://www.citylab.com/commute/2013/01/finally-transit-ticket-your-smart-phone/4414/>).
- Bottoms, Glen D., 2016. Continuing development in light rail transit in western europe. UK, France, Spain, Portugal and Italy. Transportation Research Circular E-C058: 9th Natural Light Rail Conference..
- Buisson, Christian, 2012. French tramway revival key factors of success. APTA-TRB 12th National Light Rail Conference, Salt Lake City, November 2012 (Viewed June 22th 2016 in <http://onlinepubs.trb.org/onlinepubs/conferences/2012/LRT/CBuisson.pdf>).
- Burke, Simon, 2016. Near Field Communication in Smartphones. (Viewed November 10th in [https://www.snet.tu-berlin.de/fileadmin/fg220/courses/WS1112/snet-project/nfc-insmart\\_phones\\_burkard.pdf](https://www.snet.tu-berlin.de/fileadmin/fg220/courses/WS1112/snet-project/nfc-insmart_phones_burkard.pdf)).
- Buttle, Francis, 1995. SERVQUAL: review, critique, research agenda. Eur. J. Market. 30 (1), 8–32.
- Crampton, Graham, 2002. International Comparison of Urban Light Rail Systems: the roles of integrated ticketing, pedestrianisation, and population density. ERSA2002 Conference, Dortmund, August 27th, 2002.
- Edwards, Marion, Macket, Roger L., 1996. Developing new urban public transport systems. Irrational Decision-Making Process Transp. Policy Vol. 3 (4), 225–239.
- Eric, Jaffe, 2012. 5 Reasons Germans Ride 5 Times More Mass Transit Than Americans Restrictions on Driving Is the Biggest Factor, Experts Argue in a New Study. (Oct, 5, 2012. Viewed June 20th 2016 in <http://www.citylab.com/commute/2012/10/5-reasons-germans-ride-5-times-more-transit-americans/3510>).
- Graham, Currie, Aoife, Ahern, Alexa, Delbosc, 2011. Exploring the drivers of light rail ridership: an empirical route level analysis of selected Australian, North American and European systems. Transportation 38 (3), 545–560.
- INE, 2011. Census Da População De Lisboa. .
- Iseki, H., Demisch, A., Taylor, B.D., Yoh, A.C., 2008. Evaluating the Costs and Benefits of Transit Smart Cards. California PATH Program, Institute of Transportation Studies at University of California (Viewed November 10th in <http://www.its.berkeley.edu/sites/default/files/publications/UCB/2008/PRR/UCB-ITS-PRR-2008-14.pdf>).
- Isla, 2012. Investigação Em Marketing Curso De Mestrado Em Marketing. ISLA, Lisbon.
- Lee, S.S., Senior, M.L., 2013. Do light rail services discourage car ownership and use? Evidence from census data for four English cities. J. Transp. Geogr. 29, 11–23.
- Lopes, Dírca, 2011. Metro Sul Do Tejo Com 60% De Passageiros Abaixo Do Previsto. DiPES, Diário Económico (November).
- Lynn Shostack, G., 1984. SERVQUAL and Model of Service in Harvard Business Review 84115. , pp. 133–139.
- MUNICÍPIO DE ALMADA/CÂMARA MUNICIPAL DE ALMADA, 1996. Ante Projecto Para O Metropolitano Ligeiro Da Margem Sul Do Tejo. .
- Mackett, Roger, Sutcliffe, Ela Babalik, 2003. New urban rail systems: a policy-based technique to make them more successful. J. Transp. Geogr. 11, 151–164.
- Markus, Felleson, Margareta, Friman, 2008. Perceived satisfaction with public transport service in nine european cities. J. Transp. Res. Forum 47 (3) .
- Milena, Scherer, Katrin, Dziekan, 2012. Bus or rail: an approach to explain the psychological rail factor in. J. Public Transp. 15 (1) (2012).
- Moritz, Stefan, 2005. Service Design. Practical Access to an Evolving Field. KISD-Köln International School of Service Design. (Viewed April 27th 2013, in [http://stefanmoritz.com/\\_files/Practical%20Access%20to%20Service%20Design.pdf](http://stefanmoritz.com/_files/Practical%20Access%20to%20Service%20Design.pdf)).
- Nikolopoulou, M.K., Linden, J.P.F., Lykoudis, S., 2011. Pedestrians' perception of environmental stimuli through field surveys: focus on particulate pollution. Science the Total Environment 409 (13), 2493–2502 (Viewed October 30th 2015 in <http://www.researchgate.net/publication/51051133>).
- Olesen, Mette, 2014. Framing light rail projects—case studies from Bergen, Angers and Bern. Case Stud. Transp. Policy 2, 10–19.
- Parasuraman, A., Zeithaml Valarie, A., Berry Leonard, L., 1988. SERVQUAL: a multiple item scale for measuring consumer perceptions of service quality. Journal of Retailing 64 (1), 12–40.
- Sarmiento, Claudio, 2016. People-oriented Cities: Three Keys to Quality Public Transport. Viewed May 20th in [www.thecityfix.com](http://www.thecityfix.com).
- Science and Technology Options Assessments, 2014. Integrated Urban e-ticketing for Public Transport and Touristic Sites. European Parliamentary Research Service Viewed November 1st in [http://www.europarl.europa.eu/RegData/etudes/etudes/join/2014/513551IPOL-JOIN\\_ET\(2014\)513551\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/etudes/etudes/join/2014/513551IPOL-JOIN_ET(2014)513551_EN.pdf).
- Semaly, Maunsell, Faber, 2003. Comparative Performance Data from French Tramways Systems Final Report. South Yorkshire Passenger Transport Executive.
- Shanin, Arash, 2016. SERVQUAL and Model of Service Quality Gaps: a Framework of Determining and Prioritizing Critical Factors in Delivering Quality Services. Department of management, University of Isfahan, Iran.
- Stewart, David W., Shamdasani, Prem N., Rook, Dennis, 1990. Focus Groups: Theory and Practice (Applied Social Research Methods). SAGE Publications, Inc, England.
- Stroh, S., Schneiderbauer, D., Amling, S., Kreft, C., 2007. Next Generation eTicketing. Booz Allen Hamilton GmbH. Germany, Germany.
- Taylor, Brian D., Iseki, Hiroyuki, Miller, Mark A., Smart, Michael, 2007. Thinking Outside the Bus. Understanding User Perceptions of Waiting and Transferring in Order to Increase Transit Use. USA.
- Tribunal DE CONTAS, 2011. Metro Sul Do Tejo Auditoria De Seguimento. Relatório n.º 22/2011-2.ª Secção, Lisbon (September 2011).
- Tyrinopoulos, Yannis, Antoniu, Constantinos, 2013. Factors affecting modal choice in Urban Mobility. Eur. Transp. Res. Rev. 5, 27–39.
- VOV UTP, 2015. Facts and Arguments in Favour of Swiss Public Transport 2014/2015. (Viewed June 22th 2016 in [www.voev.ch](http://www.voev.ch)).
- Van Der Bijl, Rob, Van Oort, Niels, 2014. Light Rail Explained. Better Public Transport & More Than Public Transport. EMTA (European Metropolitan Transport Authorities), Amsterdam.
- Wang, D. Tang, Bian, J., 2007. Research on methods of assessing pedestrian level. of service for sidewalk. Journal of Transportation Systems Engineering and Information Technology 7 (5), 5–10.
- Zhang, Kevin Jingyi, 2012. Bus station urban design. nine techniques for enhancing bus stops and neighbourhoods and their application in metro Vancouver. Thesis for the Master Degree of Arts. University of British Columbia.

# CHAPTER 3

## **SERVICE DESIGN AND TRANSPORTATION**



# **SERVICE DESIGN: CHALLENGES IN THE TRANSPORTATION SECTOR**

(Accepted in International Conference  
of Marketing and Design - October 2018)

With Guillermo Talavera and Miquel Domènech





## **ABSTRACT**

Service Design (SD) evolved with know-how from other areas of design (e.g. interaction design, design thinking), marketing and management, gaining importance as a reflexive and innovative process, applied to public and private services. This paper provides a state-of-the-art review about its usage in the field of transports and a showcase of relevant projects which applied SD tools.

Through the analysis of a questionnaire answered by service designers, three main challenges for the future are framed: (i) concern with the overuse of technology, that may mask user-centred perspective; (ii) usage of SD tools and processes displaced from their iterative purpose; (iii) designer's political engagement, as a way of creating positive impact in communities and people, considering sustainability and extreme users.

**Keywords:** Design Thinking, Service Design, Transports

## 1. INTRODUCTION

The Industrial Revolution and mass production allowed the democratization of objects made affordable to a larger fringe of the population.

On 20<sup>th</sup> Century, advertising and styling movements motivated consumption while new technologies and production improved labour productivity, impacting on workers' life standards and income – people had more time and money for leisure activities.

Companies grasp that customer satisfaction effect directly on their financial performance, and more attention is paid to experiences provided by services. Companies started to involve advertising and marketing specialists in the implementation of services, as well as designers, giving birth to a new design area known as Service Design (SD).

In its beginnings service design had the contribution of different fields, not only design, and it is still recognised for having somewhat “blurry borders”. Its innovative processes, achieved by the work of multidisciplinary teams are acknowledged in public and private services, like health, education and transports.

In this paper, we explore the concept of service design and the influences it received from other disciplines, with the integration of marketing management, interaction design and design thinking concepts.

SD tools have been applied to transportation projects as a way to analyse and solve problems that relate with user interaction and experience. The decisions found to solve mobility problems inside and outside urban areas, in larger or smaller communities, impact highly on people's life and should not be made light-hearted.

The literature review is connected with projects in transports, pursuing the author's line of research and their previous work (Lopes, Talavera & Domènech, 2016).

The paper is complemented with the results of a questionnaire submitted to service designers working in Europe – their feedback will frame the challenges service designers face today and how they foresee the future.

## **2. PAPER OBJECTIVES AND METHODOLOGY**

This paper is part of an ongoing research project, based on qualitative methods, which were considered relevant, for gathering and analysing empirical information from designers and users connected to the service in question (a public transport operating in Portugal).

The aims of this work are: a) review the evolution of service design definition and its contribution to the design field; b) outline the application of design methods and tools in the creation of transportation services; c) understand the position of designers about their work, its limitations and challenges.

To achieve these goals, we present a literature review about service and service design definitions proposed first by relevant scholars in marketing and management articles, and more recently by designers, proving the interest on the subject.

This work connects service design to the field of transports, with a grey literature review about transportation services that used design tools, and processes in their conception or implementation. The information was gathered in the world wide web, the projects presented were chosen by its relevance and interest relating with user interaction in transports.

### **2.1. Limitations from this study**

Service design is a young field in design research, it involves mainly the work of private companies and there is a lack of published academic work. This is also evident for the publication of design projects, results or studies in transportation, and can affect the quantity of information presented. Nevertheless, we will try to sustain references from grey literature, with statement from companies and designers involved in service design projects, in order to pursue our goals. Accordingly, the last section of this paper, will present the results of a questionnaire proposed to a group of service designers. These professionals were contacted through the social network LinkedIn.

The respondents work mainly in Europe, and some belong to the companies involved in transportation projects from section 5. They were chosen for their availability, and

their statements are private, do not represent the vision of the companies where they work. To analyse their answers, we crossed points of view and tried to achieve contrasting or agreeing trends about the subjects proposed.

This paper is organized as follows: section 3 and 4 present a literature review about service and service design definitions; section 5 outlines relevant transport projects which applied service design tools. Section 6 presents the results of a questionnaire proposed to service designers

Part 7 discusses findings, and the last section concludes this work.

### **3. WHAT ARE SERVICES?**

Services comprehend a complex and extensive number of activities delivered to consumers by corporations or directly by particulars; which cannot be stored or consumed. People use services during a limited period of time, repeatedly or just once, not always in the same way, OECD<sup>1</sup> defines services as *“outputs produced to order and which cannot be traded separately from their production. (...) By the time their production is completed they must have been provided to the consumers”*. (ILO, IMF, OECD, Eurostat, UNECE, World Bank, 2004).

Vargo and Lusch define services *“as the application of specialised competences (knowledge and skills) through deeds, processes, and performances in the benefit of another entity or the entity itself.”* (2004b, p.2).

Blomkvist defends that *“a service can be seen as a journey (...) consisting of many stops along the way where a customer interacts with a service provider.”* (2011, p.1); *“The success of a particular service rests on the quality of customers’ subjective experience.”* (Morrelli, 2009, p. 154).

In the initial period of service research (1950-1980) marketing and the sub-discipline of service marketing originally based on a *“goods-centred, manufacturing-based model of economic exchange developed during the Industrial Revolution”* (Vargo & Lusch,

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1. Organization for Economic Cooperation and Development

2004a, p. 325) framed service's paradigms. Archetypes to distinguish goods from services were discussed and the extensive literature review from Zeithaml and Berry (1985) ratified four most commonly accepted characteristics – the IHIP paradigm – to distinguish services from goods production. IHIP means:

**1. Intangibility:** lack of palpable or tactile quality of a service, its “transparency”, and immateriality. Services are performed and consumed through touchpoints, the components of the service where the interaction takes place (a ticket vending machine, a timetable information billboard). They cannot be owned and are not separable from consumption, contrary to goods.

**2. Heterogeneity:** services are never equally provided or consumed; interaction depends on clients' individual behaviours and preferences.

**3. Inseparability (of production and consumption):** services do not exist until they are provided and experienced by consumers, in most services production and consumption are simultaneous. Stages for goods production and consumption are clearly differentiated, they are first produced, then sold, and finally consumed.

**4. Perishability:** services cannot be stored, or pre-produced; they are provided and consumed in the same time or during a short period.

In more recent years different authors questioned the efficiency of IHIP model, pointing out substantial weak points in the IHIP paradigm, exposing limitations for its definitions: **1.** Not all service results are intangible, *“Services often have tangible results and tangible goods are often purchased for intangible benefits”*; **2.** Heterogeneity is not an accurate characteristic from services, sometimes *“services are relatively standardized”* and tangible can often be heterogeneous; **3.** Inseparability, *“the consumer is always involved in the ‘production’ of the value”*; **4.** Perishability, *“tangible goods are perishable and many services result in long-lasting benefits”* (Vargo & Lusch, 2004b, p. 327). *“From a consumer and a marketing perspective, these characteristics may not only fail to differentiate services from goods but their delineation may point marketers in a wrong normative direction.”* (ibid, p. 332).

Vargo & Lusch sustain that the manufacturing dominant logic has shifted “*away from tangibles and toward intangibles, such as skills, information, and knowledge, and toward interactivity and connectivity and ongoing relationships. The orientation has shifted from the producer to the consumer.*” (2004a, p. 15). The authors anticipate a new paradigm based on a service-centred dominant logic, with the “*potential to replace the traditional goods-centred paradigm*” (ibid, p. 15).

The new paradigm focuses on the importance of exchanging skills and knowledge, something transversal to all services. Service design integrates service perceptions which are affected by behaviour and the environment where the service is provided – lightning conditions, temperature, noise, smell – the surrounding space and objects. Designers are concerned with providing the best possible user experience acknowledging user-centred perspective. The integration of design teams and methodologies in the creation of services is related with positive feedback and customer loyalty towards the service, and sustained the emerging new field named Service Design.

#### **4. WHAT IS SERVICE DESIGN?**

*“Service Design is an interdisciplinary approach that combines different methods and tools from various disciplines. It is a new way of thinking as opposed to a new stand-alone academic discipline.”* (Stickdorn & Schneider, 2012, p. 22).

Service Design emerged as a discipline in the early 1980’s, integrating concepts from different backgrounds. As in any other young field, professionals did not have a formal education, and the first service designers came from different fields of design like interaction, industrial or communication. The convergence of their skills resulted in a transversal definition of SD, with practices and tools inherited from other design disciplines, mainly following three lines of thought: marketing /management, design thinking and interaction design.

##### **4.1. Marketing/management**

Upon Vargo & Lusch marketing evolved from an early conception of customer satisfac-

tion where *“Customers do not buy things but need or want: the firm’s only purpose is to create a satisfied customer”* to a modern conception where selling actions can be manipulated or *“falsified”* as a way of enabling companies *“to learn about their actions and find ways to better serve their customers and to improve financial performance”* (2004b, p. 2).

Services provided on a user-centred basis conclude on more satisfactory and efficient experiences, and customer’s loyalty. Marketing is *“concerned with identifying customers and initiating and maintaining relations with them in ways that create value both for customers and organisations.”* (Stickdorn & Schneider, 2012, p. 41).

In her article *“Design Services that Deliver”* (1984), Shostack integrated management and marketing disciplines with methods from design, as a way to solve problems in service conception. She was the first author to relate the words service and design.

Morelli (2009) and Moritz (2005) sustain the writings of Shostack, and the direction SD has taken, upon her influence. Designing services is a process that looks at services from a customer-centred perspective which is connected with marketing research, and grounds in user’s demographic characterization to develop new products and services, or reshape old ones.

Companies use techniques such as participant observation and exploratory research to evaluate services, which need to be continuously adapted in order to gain customers, improve efficiency and quality.

Due to its object of work, SD also grounds in management studies, organisation and engineering *“this area emphasised technical and organisational aspects in designing a service, looking at it as a production system”*. (Morelli, 2009, p. 151). Management provides a context that considers the impossibility to store services, and their high level of personal interaction.

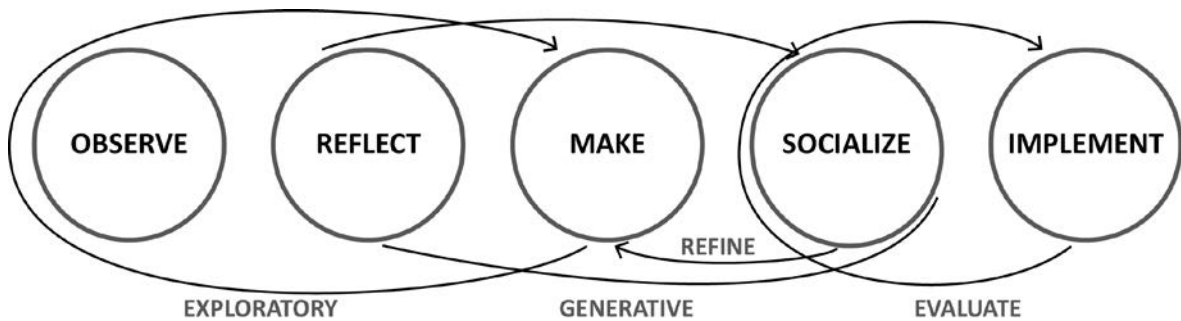
## **4.2. Design thinking**

Design is based on reflexive work, integrating different stages that change during the process *“designers co-create problems and solutions in an exploratory iterative process*



*in which problems and solutions co-evolve.*" (Stickdorn & Schneider, 2012, p.1). The steps of the design thinking process are presented by Holmlid in the next graphic (Figure 1).

**Figure 1:** Integrated Design process and people centred-research



Source: Stefan Holmlid, (2010). Service design and product service systems, p.6.

### **Exploratory phase (research)**

- 1. Observe:** immersive phase, the designer contacts with people involved, users, community, other stakeholders, environment, and organisations.
- 2. Reflect:** reflexive phase, it leads to the model creation.

### **Generative phase (action)**

- 3. Make:** strategies, mock-ups, concepts to use.
- 4. Socialize:** presentation, iteration with other people involved.

### **Evaluation phase (reflexing, feedback)**

- 5. Implement:** making the concepts real.

This systematic methodology was considered a designers' particular way of acting, a shared design thinking process *"in which [designers] frame problems and opportunities from a human-centred perspective, use visual methods to explore and generate ideas, and engage potential users and stakeholders"* (Kimbell, 2011, p.1). Design thinking applies design sensibility and methods, *"to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity."* (Brown, 2008, p. 1).

Cooper, Juginger & Lockwood define 3 characteristics of Thinking, when applied to the design process: **thinking of** – “*imagining, visualising, dreaming*”; **thinking about** – “*an activity during which one considers, reflects, and deliberates*”, and **thinking through** – when “*something is to understand, to grasp, to figure out*”. (2010, p. 58). Design thinking exists since the beginning of design, when the dominant logic was still manufacturing. With the development of the tertiary sector, design thinking, (creativity in systems, products and communication) is considered highly relevant for the development and implementation of innovative services.

### **4.3. Interaction design**

Scandinavian design and Human-computer Interaction (HCI) were the roots of interaction design. HCI, based on concepts from cognitive psychology, studied people’s interaction with computers, gathering information and applying it on the development of new systems (Löwgren & Stolterman, 2004).

The study of human behaviour processes was used to understand interaction between users and systems: “*Design of behaviour requires an understanding of the user’ relationship with the product from purchase to end-of-life*”. (Cooper and Reimann, 2003, p. 9). Interaction design focus in user goals and tasks, and the cognitive and behavioural processes used to achieve these goals.

Moggridge, considered “the father of Interaction Design”, defined the field in a broader sense, “*interaction design is the design of everything that is both digital and interactive*” (2007, p. 660).

Saffer supports the relation of interaction design, psychology and behaviour, stressing that it is “*the view focus on functionality and feedback: how products behave and provide feedback based on what the people engaged with them are doing*”. (2010, p. 4).

Holmlid (2007), Morelli (2009), Deshpande (2012), and Mager (2009) reinforce the importance of users “*the aim of service design is to ensure that service interfaces are useful, usable and desirable from the client’s point of view and effective, efficient and distinctive from the supplier’s point of view*” (Deshpande, 2012, p. 1). “*The process applies*

*explorative, generative, and evaluative design approaches.*" (Rytilahti, 2015, p. 87).

Enninga *et. al.* defends that "Service Design (...) is a process of creative enquiry aimed at the experiences of the individual user". (2013, p. 13).

Upon Birgit Mager, "Service design addresses the functionality and form of services from the perspective of the user. It aims to ensure that service interfaces are useful, usable, and desirable from the client's point of view and effective, efficient, and distinctive from the supplier's point of view." (2009, p. 34)

Nisula defines "service design to service concept, design of operative details and to the design delivery process and system." (2012, p. 2). A service is seen as an interaction, provided homogeneously and differently experienced by users.

Smith (2007) proposed four dimensions to ground the work of interaction designers: **words** – easier and simpler information to the end-user; **visual representations** – graphics or images, which are normally more immediate to understand, when carefully used; **physical objects and space**, which refers to all objects and space where the interaction takes place; **the behaviour and time user spends interacting**, customer's tasks during the interaction and its goals. This model allows the creation of more efficient interfaces and interactive objects.

Moritz refer SD as the design of one "overall experience, as well as the design of the process and strategy to provide a service". This ongoing process "creates and shapes the client interface and crafts all details of the service journey" (2005, p. 2). Design methodology and principles are consistently applied to the design of a service, and a successful service must have at least three outcomes: **a) consumer desirability**, answering to a consumer need, solving a user problem; **b) technical feasibility**, which implies focused studies and tests adapted to existent technology; **c) commercial viability** (Cautela *et. al.*, 2009).

SD uses tools, inherited from other design areas, as part of the design thinking process. The Design Council (2015) explains the process which integrates four stages, each one with specific goals and design tools that help to frame and find solutions to design problems: **1. Discover**, phase where the designer gathers information about the

problem, identifies user needs and develops initial ideas. Specific tools from this phase include: *User Journey Mapping*, *User Diaries*, *Service Safari* and *User Shadowing*. **2. Define**, when designers assemble all the information and organize it in eventual solutions for the design problem. Tools most used are: *User Personas*, *Brainstorming* and *Design Brief*. **3. Develop** when solutions are prototyped and tested, helping designers to solve errors and redefine ideas. Key tools during this phase are: *Service Blueprinting*, *Experience Prototyping* and *Business Model Canvas*. **4. Deliver**, last stage of the design process, when the resulting service is finalised and launched. *Scenarios* is the tool most used during this stage.

These tools are often used in the design of services (like in products or graphics), shortening the distance between designers and users or stakeholders involved in projects. They are also a valuable resource in the development of transportation services, and what we propose next is to exemplify their usage in transport projects, where SD was relevant to improve services and user perceptions, achieving company's goals and rising customer loyalty.

## **5. SERVICE DESIGN IN THE TRANSPORTATION SECTOR**

In recent years particular attention has been paid to urban planning, especially in highly populated locations. Governments and policy makers realized the importance of mobility in the paradigm of a safer and sustainable environment, (Tyrynopoulos & Antoniou, 2013). Mobility and transport modes are directly related with the wellbeing of cities' inhabitants and they are a decision factor for people when settling somewhere. The European Community produced several reports about mobility: the *Green Paper for Urban Mobility* "which addresses the main challenges related to urban mobility through five core themes: free flowing towns and cities, greener towns and cities; smarter urban transport, accessible urban transport, and safe and secure transport" (Tyrynopoulos & Antoniou, 2013, p. 25); the *European 2020 Strategy*, that highlighted "the importance of an efficient and effective transport system for the future development of the European Union" (European Commission, 2010, p. 15); The *2011 Transport White Paper* "Towards

*a single European Transport Area*” that announced several proposals to be addressed by Sustainable Urban Mobility Plans. This last report stressed the relevance of including user’s consultation on the process, registering people’s expectations as *“essential factors to build a more acceptable and efficient transport infrastructure and manage the associated transport services”* (European Union, 2011, p. 52).

Improving mobility means the development of modern infrastructure, traffic management tools, awareness campaigns, mobility schemes and IT solutions. Government and private stakeholders recognize the necessity of a user-centred perspective in an industry that was previously very strongly technology and infrastructure-led.

Following the discussion started by EU, transportation companies have been working together with designers to achieve creative solutions in public services and transports, acknowledging user-centred perspective and its relevance to create more efficient transport services. Next, we present a showcase of projects in transportation services with the collaboration of design companies which used design tools. The information refers to projects that were implemented in Europe, and grounds on grey literature. Like we referred on this work’s introduction there are no relevant academic studies about ongoing or recent transportation projects. We assume that the reason for this non-disclosure is the requirement of confidentiality by the companies involved on projects, they are in general only mentioned on the companies’ websites.

### **Danish Railway Company - DSB, Holland**

DSB needed to improve the interaction of their clients with trains and related services (timetables information, tickets buying, services at the stations), which was not efficient and lead to complaints about the service. In 2012 the company commissioned *It’s a Bird* with the purpose of addressing users’ perceptions and improving user’s journey experience, on issues such as comfort and cleanliness.

*It’s a Bird* conducted **participant observation** in four touchpoints: train, platform, staff, and communication, acting like any other customers from DSB, recording and underlining tensions and contradictions reported by customers. With these data, the

service design company proposed to DSB a catalogue of recommendations “to enhance the experience of passengers on the train” and raise customer satisfaction levels.

Within the same study, DSB needed to rate the cleaning quality from the service, upon the customer. Designers made **participant observation** and **ethnographic interviews** (ethnographic interviews are semi-conducted interviews intended to gather information about people’s interests, the way they relate or use a service or a product), to define how customers perceived “the clean journey”. Passengers reported different types of dirt (rolling beer cans, bad smell, graffiti, paper on the floor, etc.) at different physical and emotional levels, and the designers became aware that DSB had a very static and broad cleaning approach.

Conclusions point out that cleanliness (for the DSB customers) was not only a visual issue, but also an emotional multisensorial problem; bad smell contributed to a bad perception towards the journey, and it interfered with people’s personal space, creating general discomfort.

As a result of this study DSB took action in areas related with cleanliness and comfort, improving the overall customer experience. The work with *It’s a Bird* extended after 2012, helping the company to implement what was named as a “premium service concept”. In [http://isitabird.dk/cases/dsb\\_comfort](http://isitabird.dk/cases/dsb_comfort)

## **Heathrow Express Train - HE, England**

Heathrow Express is a train service that connects Heathrow Airport to the centre of London. The trains are known to be convenient and reliable, and the service was used without planning or previously purchased tickets. The company had difficulties to contact customers about timetables’ change or problems in the service, when they needed to. *Webcredible* was commissioned to improve communication with clients; re-design timetables on desktop and mobile connections; create a new information representation model (online and offline) and improve the user experience and service accessibility.

The service design company conducted **workshops, context observation, customer**

**journey maps**, and **touchpoint** analysis to incorporate user experience and expectations on the project results. Workshops, context observation and touchpoint analysis were chosen to create insights about the service experience, revealing customer's feelings and reactions. After assembling all data, designers can then represent it visually in journey maps, that capture routines, activities during the experience, and all different interactions.

The result from this study integrated proposals for timetable presentation and service information in digital platforms, and allowed HE to gather insights, and implement digital solutions in operational processes, impacting in customer behaviour when checking information before travel, and communication efficiency between HE and its users. In <https://www.webcredible.com/case-studies/travel/heathrow-express/>

## **London Underground, England**

London Underground, The Tube, as it is informally known is the oldest underground service in Europe. Its history is full of picturesque episodes and it is also an example of innovative signage usage. Live|work Studio, with offices in several European cities is known to be one of the first service design companies collaborating with public services in the U.K.

The London Underground hired *Live/work* to redesign customer service, with the purpose of upgrading the traditional way of interaction (staff behind ticket windows), to a face-to-face approach with staff directly interacting with customers on ticket halls, and platforms. *Live/work* implemented a collaborative engagement programme, based on **intense customer and staff behaviour observation**, promoting workshop conclusions, reshaping customer service, and applying modern service parameters according to customer expectations. Stations became better integrated in their location, adding commercial value to local people and businesses, and the result was costs saving and improved efficiency in the London Underground.

In <https://www.liveworkstudio.com/client-cases/london-underground-delivering-fit-for-future-stations/>

## **Metroselskabet, Denmark**

Metroselskabet is the metro company founded in Copenhagen in 2007, it had a strong investment in mobility, and expanded its network on recent years. *Design it*, a service design company with offices in Denmark and other 14 world locations was contacted to create a design vision for Copenhagen Metro's new City Circle Line. This line with 16 Km and 17 stations represents the most modern transportation service in Denmark, with about 275,000 passengers being transported per day.

*Design it* based its study on **intensive user observation**, and **focus groups**, presenting a design manual, with a "*clear operational description of the interior and exterior design of the train*". The project assures a "*shared and coherent design vision for all elements in the City Circle Line, such as trains, stations and maintenance centres.*"

(<https://designit.com/cases/from-train-ride-to-travel-experience>).

## **RATP - Régie Autonome des Transports Parisiens, France**

RATP is part of an international company that presents mobility solutions in different countries (like Saudi Arabia, Hong Kong, and India) France included.

In their strategy for developing new innovative services and improved interaction points for customers in the transports of Paris, the company needed a new vending machine, the interface and hardware of an information panel, to be placed in every RATP station. Paris is known to be one of the cities with more tourists in the world, in 2017 Greater Paris exceeded a record of 40 million tourists, (according to the Paris Official website of the Convention and Visitors Bureau) and the new vending machine interface needed to be accessible to "*an extremely diverse user population, and user logic*".

*Attoma* was the design company selected to work with RATP and developed **Navigo**, a new payment platform, with a contactless journey card and touch screen. The system integrates simple navigation principles and simple, expressive graphics, which encourage a positive perception of the user interface.

The designers that collaborated in the project "*Provided a fine understanding of the views and uses of clients*" conducting context observation and co-design workshops to



understand customer needs. With the information gathered the company proposed and tested prototypes, before developing an intuitive and user-friendly interface. The new models are also available in versions for visually impaired and blind users, and were awarded with two Stars by the Design Observer.

In <http://www.attoma.eu/en/project/ratp-navigo>

## **SNCF – Société Nationale des Chemins de fer Français, France**

*Attoma* was also the chosen partner to create a customer experience guide, and a mobile app for SNCF, the French National Railway Company.

In a preliminary work, designers compared experiences in six different locations (a museum, an airport, a parking garage, a post office, a shopping centre, a train station) and determined travel routes, critical touchpoints and key elements of the experience. The overall experience was analysed and complemented with observations and interviews. *Attoma* mapped 12 different user experiences, trying to outline the best experience and best practices for each location. Appropriate requirements and customer expectations for each journey were used to define a user's experience model.

Using co-creation workshops the design company implemented best practices, and laid out the principles of a customer experience guide, *"based on the appropriate requirements and expectations of each journey"*.

In <http://www.attoma.eu/en/project/sncf-a-customer-experience-guide/>

## **6. SURVEY**

Alongside the case studies, a survey was submitted to designers who work and do research in SD, through LinkedIn, during June and July 2017.

The aims of the survey were: a) to provide supportive information to the interpretation of presented projects; b) to understand the changes occurred in SD in recent years and challenges and obstacles that designers face.

The questionnaire was developed after the literature analysis previously presented. Participants were designers working in service design companies worldwide. We re-

ceived 15 complete answers from three respondents in USA, one in Brazil, one in Colombia and ten in Europe (Barcelona, Brussels, Copenhagen, Norway, UK).

The analysis was made crossing statements from different respondents which result in opinion trends that not always express unanimous agreement.

**Q1: What are the obstacles that SD companies face when involved in a project?**

Four common challenges were described:

**a) Understanding customer expectations** and be able to define efficient and sustainable collaboration models, more sensitive in long projects *“that aspire to transform business processes in the organisational structure itself.” (R.06).*

**b) Define project perimeter.** Clearly shape the project aim, levels of SD intervention and impact desired with the client. SD professionals work with intangible goods – human factors that are subjective, and complex to define and explain, and achieving this goal is not a straightforward assumption.

**c) Communication.** Involve all stakeholders in the same effort, appropriately communicating what is being made and what is asked from people. A challenge for big organisations, with many hierarchy levels and different managerial processes, but also in small companies with informal relations that can disregard planning.

**d) Measuring the impact of SD work.** Defining the project evaluation before and during its implementation; anticipating problems and results keep project’s objectives on line. Professionals also expressed concern about stakeholder’s lack of awareness about SD skills and concepts, that *“tends to push clients towards service solutions based on old processes and new technologies, rather than a full review of client needs and how best to meet them.” (R.03).*

**Q2: What is the best way of involving citizens in SD projects? Do people and companies realise the importance of people’s participation on these studies?**

Two major concerns were mentioned:

**a)** Users driving design is not what is wanted, even if their participation essential, *“users*

*can be very resistant to change and fail to understand the benefits of major shifts.” (R.03); the value of having “the right person at the table” when doing participatory activities was stressed “the best way is to focus on extreme users and find the ones with completely different needs, drives and perspectives.” (R.02) These should be not only end users, but also “stakeholders that will be owners and decision-makers later on the process.” (R.06)*

**b)** Organisations are not always at ease with *“the implications of bringing users/clients into the working process. They are more comfortable with old-fashioned focus-group techniques where implications are totally different.” (R.04)*

In political issues, research results can be unpredictable, and public organisations *“do not want to open participation before they know what will they do or the participation’s results.” (R.05)*

Making sure the appropriate network is involved in a project – local associations, influencers or community leaders – is a key issue for the success of participatory activities. People should be clearly addressed on the purpose of their collaboration and stay focused on goals. Respondents defend the necessity of people’s commitment beyond *“encouraging participation through reward.” (R.06)*. Motivation and sense of relevance is essential for driving people’s engagement in projects.

Opinions converged on ethnography, interviews, surveys, and co-creative workshops as the best tools for participatory activities.

### **Q3: Are there SD tools more effective than others?**

*“There are no tools better than others”. (R.03).*

Tools’ choice, use or fit, depends on the type of service, industry, scope, project stage, audience, as well as budget and project length.

Designers need to be flexible, but mostly be clearly aware of goals and specific projects’ needs to better understand how to apply different design tools.

The importance of synthesis and prototyping tools was stressed: *“Synthesis tools help designers to organise and visualise complex information in a more tangible way to empower a deeper understanding of the reality, e. g.: user personas, user archetype, custom-*

*er journey, blueprints, storyboards, ecosystem maps.”*

In the prototyping phase tools like mock-ups, scale models, and rudimentary acted-out scenarios allow the test of solutions prior to their implementation.

Design tools are “only tools”, a way of improving a process allowing reflexion about it, they contribute to the strength of SD, but SD *“is not about the tools, it is about how these tools are connected together in a project, to change reality.”* (R.11)

#### **Q4: Thinking in all the projects in which you were involved, which stood out because of their difficulty or relevance?**

Designers referred:

- Demanding projects as those more gratifying at personal and professional level;
- Work with social impact on big communities but also in “smaller” projects that change experience in a company;
- Projects with highly iterative and collaborative processes that drive innovation within organisations;
- Working with humanitarian organisations that deal with disaster management, every day more demanding *“due to macroeconomic and political factors, such as rapid urbanization and active conflicts.”* (R.06);
- Projects where SD is a long-term strategy, and contribute to implement best practices and concepts for better performance.

Q5: What do you think will be the biggest challenges for SD in the future?

Two principal questions mentioned were SD borders and technologies usage meaning:

a) SD independency from other disciplines *“SD is a field that has taken the best bits of many design disciplines, mashed it up and added a bit new. The boundaries between SD and UX, for instance, are very blurry.”* (R.07)

The mass use of the term now when “everyone” is aware of its relevance, raises doubts about companies’ level of knowledge and what is being offered as SD *“people are selling ‘service design’ when all they are really doing is offering some workshops or a bit of journey mapping. This is endangering the value of the term.”* (R.11)

*“The challenge is to keep relevant when you told people everybody is ‘capable of designing’ and you have given them tools to work.” (R. 08)*

b) Increase usage of technology, apps and computer-based solutions that foresee difficult the user-centred approach *“understanding SD as something that happens in screens and not also human-to-human and other touchpoints.” (R.04)*

*“Designers should also take in account the security needs when a device is in people’s homes and everything is connected. We need to take responsibility and design for the possible negative ramifications of our work.” (R.09)*

Design work has always balanced between a consummation perspective (creation of products/ communication to “sell”) and political engagement. This political trend is each day more relevant because of SD impact on society; it means *“design going strategic. Shifting decisions, environmental and social impact requires awareness of SD work’s political effects – designers should be more political involved.” (R.05)*

SD is about changing lifestyles more than interactions to create better experiences, with a more sustainable configuration *“be more explicit about people, interaction and our life shaping”* which is the next big challenge for the future.

## **7. DISCUSSION**

In this paper, we became conscious of the growing interest about SD and importance of its processes when applied to different services, namely in the transportation sector. We revised academic and grey literature that reinforce the importance of using SD tools and processes. After analysing the data collected in a designer’s survey three main areas of concern were pointed out:

### **7.1. Users vs Technology?**

The adoption of reflexive and iterative processes in SD, was vital to shape the field as we know it today. Before SD companies were essentially concerned about service’s delivery, using marketing and management know-how that consider customer only from its economical revenue.

Design Thinking changed the focus of SD, stressing the user-centred perspective in all phases of the design process (Brown, 2008; Deshpande, 2012; Holmlid, 2007; Kimbell, 2011; Mager, 2009 and Morelli, 2009), even with service's commercial viability still "on the horizon".

In the transportation sector, balance between quality of services (how and what services are provided) and financial results is very sensitive. According to the transportation projects presented on this work, some solutions go through the reduction of staff, and its replacement by some kind of technology (*e.g.* London Underground case, Navigo from RATP).

Designers expressed a general concern about the way technology "easy" solutions are applied: companies choose to create apps, improve point of sale using touchscreens, timetable displays, applications, which need to be extremely well designed and adapted to human interaction, and do not replace face-to-face interaction.

On other hand the usage of private data and the way companies access it, is also problematic. The display and access of personal information to an entire user's system anytime and anywhere is already being achieved by mobile internet communities: *"social networks have been continuously growing and popular platforms are amongst the most visited websites. Web-based communities allow users to use their functionalities on current mobile devices, e. g. to post and work with the location information"* (Hermann, Blach, Janssen, Klein, Schuller, & Spath, 2009, p. 2). Policies protect citizens and prevent the abusive usage of private data, but adapting new touchpoints and technology bearing in mind data privacy is surely a challenge for SD.

## **7.1. Service Design tools**

Tools and processes inherited from manufacturing are also critical in services. Used in collaboration with other methods from social sciences and marketing, their relevance is acknowledged by public and private companies.

Although the importance of tools tends to be exaggerated, with the possibility of SD becoming more important by its processes than by its goals, (according to designer's

opinions); if used correctly, they definitely help to build innovative and optimised services. The survey's respondents stressed that professionals should bear in mind one of the most important premises of design – the human-centred perspective, which is sometimes not aligned with commercial solutions.

SD tools are used to gather information about users, especially in project's initial phase, and support direct contact with people.

Chasanidou, Gasparini, & Lee refer the importance of the right tools, *“to effective decision making and communication in a multidisciplinary team”* (2015, p. 4). They also state that *“relying exclusively on business and technical tools does not help project effective decisions, especially as the user may prefer another path.”* (2015, p. 9).

Choosing the right tools depends mainly on the purpose in view *“the kinds of tools used in SD vary widely, covering a range of viewpoints, communication styles and usage scenarios (...) what is more important than the choice of tool, is the choice of purpose – how the tools are used to perform specific activities.”* (Pichlis, 2014, p. 73).

In the survey, designers expressed concern about the massive usage of tools. They defend the interest of including multidisciplinary teams in SD projects, but think that designers should still be in charge of these teams, so the work processes are effective and tools efficiently applied.

### **7.3. Political engagement**

In their paper *Evolving to a New Dominant logic* Vargo & Lusch (2004a) recognise a change of society's paradigm from a manufacturing to a service logic: designers from the first half of 20<sup>th</sup> century were concerned with object production, function and form. Aesthetics was a less prominent feature of objects, and the purpose of designers was to produce better quality artefacts accessible to everybody, even if they were not “beautiful”. After the Second World War, styling movements and the growth of consumer society gave relevance to aesthetics. Companies needed to differentiate their products and raise their outcomes. However, design movements did not forget design principles, creating objects and services more adequate, more comfortable, more useful.

This capacity of making things accessible, known and visible, articulating information that causes inquiry and disruption in the status quo makes the field to be seen as political engagement, disruptive from installed politics.

Especially in public services, SD is a field that explores this disruptive aspect of design: the acknowledgment of problems in transportation that interfere with mobility in urban areas, it is a claim for change.

Areas like critical design, participatory design, sustainable design and tactical media are all unified by their action of disruption. SD brings to stage neglected or excluded groups and communities *“embodying alternative thoughts, offering alternative forms, and advocating for alternative interests providing an interrogation and challenge of hegemonic representation and interest.”* (Rudnicki, 2017, p. 25).

SD impacts on people’s life and achieves more democratic results, by including user-centred perspectives and extreme user’s point of view.

The promotion of equitable design, considering info-excluded, less resourced, less informed citizens is considered (upon the questionnaire’s results) absolutely vital. Long-term and environmentally friendly solutions, (with renewable energies, for instance) is something that should concern designers.

Adding to service experience improvement, SD is also about changing lifestyles, reflecting a better, more ecological understanding of the environment and planet resources, and reducing waste in the end of the consumption process. This is an ethical imperative for designers that work in sensitive fields like small or less-resourced communities, but should also be assumed by professionals working in more globalised areas.

## **8. CONCLUSIONS AND FURTHER WORK**

Service design is an emerging field of design that as evolved from other areas and is now widespread because of its processes that help to improve services and customer’s loyalty. Companies acknowledged the importance of the user-centred perspective in the implementation of services and with the years companies are growing on expertise and collaborating with projects on public or private domain. The transportation sector



is a good example of this partnership, presenting interesting and efficient projects that were made possible by the use of design tools in the creation phase.

In spite of the positive outcome and perceptions towards the field, there are also concerns about the fast changes that have been occurring, designers expressed concern about the “overuse” of technology, disregard use of tools and general democratisation of design processes, that can put in stake ethical principles of design.

## REFERENCES

**Blomkvist, J.** (2011). *Conceptualising prototypes in service design*. (Licenciate thesis. Linköping University, Sweden). Retrieved from <http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A412916&dswid=6886>

**Brown, T.** (2008). *Design Thinking*. Harvard Business Review 84-92.

**Cautela, C.; Rizzo, F. & Zurlo, F.** (2009). "Service design logic: an approach based on the different service categories". *Proceedings of IASDR International Conference*, 18-22 October, 4317-4326.

**Chasanidou, D.; Gasparini, A. & Lee, E.** (2015). *Design Thinking Methods and Tools for Innovation*. A. Marcus (Ed.), Part I, LNCS 9186. 12–23.

**Cooper, R.; Juginger, S.; Lockwood, T.** (2010). *Design Thinking and Design Management. A research and Practice Perspective. Design Thinking. Integrating Innovation, Customer Experience, and Brand Value*. Thomas Lockwood (Ed.). New York: Allworth Press.

**Cooper, A. & Reimann, R.** (2003). *About Face 2.0: The Essentials of Interaction Design*. USA: Wiley Press.

**Design Council.** (2015) *Design methods for developing services. An introduction to service design and a selection of service design tools*. Retrieved from <https://www.design-council.org.uk/sites/default/files/asset/document/Design%20methods%20for%20developing%20services.pdf>

**Deshpande, P.** (2012). *On the notion of the user in Service Design*. Cumulus Northern WorldMandate conference, Helsinki.

**European Commission** (2010) *European 2020 Strategy. A European strategy for smart, sustainable and inclusive growth*. Retrieved from <http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf>

**European Union** (2011) *White Paper on Transport. Roadmap on to a single European Transport Area — towards a competitive and Resource – efficient transport system*. Luxembourg: Publications Office of the European Union. Retrieved from [https://ec.europa.eu/transport/sites/transport/files/themes/strategies/doc/2011\\_white\\_paper/](https://ec.europa.eu/transport/sites/transport/files/themes/strategies/doc/2011_white_paper/)

white-paper-illustrated-brochure\_en.pdf

**Enninga, T. et. al.** (2013). *Insights from nine case studies*. Research Centre Technology & Innovation. Retrieved from [https://www.stby.eu/wp\\_15/wp-content/uploads/2013/12/Service-Design-insights-from-nine-case-studies.pdf](https://www.stby.eu/wp_15/wp-content/uploads/2013/12/Service-Design-insights-from-nine-case-studies.pdf)

**Egan, J.** (2009). *Marketing evolution: the true and place for service-dominant logic?* Naples forum on Service, Naples, Italy. Retrieved from [http://www.naplesforumonservice.it/uploads//files/EGAN\\_MARKETING%20EVOLUTION\\_THE%20TIME%20AND%20PLACE%20FOR%20SERVICE-DOMINANT%20LOGIC.pdf](http://www.naplesforumonservice.it/uploads//files/EGAN_MARKETING%20EVOLUTION_THE%20TIME%20AND%20PLACE%20FOR%20SERVICE-DOMINANT%20LOGIC.pdf)

**Hermann, F.; Blach, R.; Janssen, D.; Klein, T.; Schuller, A., & Spath, D.** (2009). "Challenges for User Centered Smart Environments". *Human-Computer Interaction Part III*, 407–415.

**Holmlid, S.** (2009). "Expanding a comparison of Design Disciplines, Human-centered systems". *Nordes, Vol. 2*. Sweden. Retrieved from <https://scholar.google.se/citations?user=OfW2tZ8AAAAJ&hl=en>

**Holmlid, S.** (2010). "Service design and product-service systems". *Proceedings CIRP IPS2 Conference 2010*, 195-202. Linköping University, Sweden.

**Hultman, J. & Ek, R.** (2011). "Can there only be one? Towards a post-paradigmatic service marketing approach" *International Journal of Quality and Service Sciences* Vol. 3 No. 2, 2011, 166-180. Retrieved from [https://www.researchgate.net/publication/235284294\\_Can\\_there\\_only\\_be\\_one\\_Towards\\_a\\_post-paradigmatic\\_service\\_marketing\\_approach](https://www.researchgate.net/publication/235284294_Can_there_only_be_one_Towards_a_post-paradigmatic_service_marketing_approach)

**ILO, IMF, OECD, Eurostat, UNECE, World Bank** (2004), *Producer Price Index Manual: Theory and Practice*, International Monetary Fund. Washington DC. Retrieved from <https://stats.oecd.org/glossary/detail.asp?ID=2431>

**Kimbell, L.** (2011). "Designing for Services as one way of designing Services". *International Journal of Design*, Vol. 5 (2), 41-52.

**Lopes, A.; Talavera, G.; Domènech, M.** (2016). "Metro Sul do Tejo: Service design and user feedback". *Case Studies in Transport Policy*, Vol. 4 306-315.

**Lovelock, C. & Gummesson, E.** (2004) "Whither Services Marketing? In Search of a

New Paradigm and Fresh Perspectives”. *Journal of Service Research* Vol. 7 (1), 20-41. Retrieved from [https://www.researchgate.net/profile/Evert\\_Gummesson/publication/235362595\\_Whither\\_Services\\_Marketing\\_In\\_Search\\_of\\_a\\_New\\_Paradigm\\_and\\_Fresh\\_Perspectives/links/00b7d52c1ca0b0785a000000.pdf](https://www.researchgate.net/profile/Evert_Gummesson/publication/235362595_Whither_Services_Marketing_In_Search_of_a_New_Paradigm_and_Fresh_Perspectives/links/00b7d52c1ca0b0785a000000.pdf)

**Löwgren, J. & Stolterman, E.** (2004). *Thoughtful interaction design. A design perspective on information technology*. London: The Mit Press.

**Mager, B.** (2009). “Service Design as an emerging field. Part one”. In: Miettinen & Koivisto (Eds.). *Designing Services with Innovative Methods*, Helsinki: Taik Publications, p. 28-42. Retrieved from [https://www.academia.edu/20566424/Service\\_Design\\_-\\_An\\_Emerging\\_Field](https://www.academia.edu/20566424/Service_Design_-_An_Emerging_Field)

**Moggridge, B.** (2007). *Designing Interactions*. U.K.: MIT Press.

**Morelli, N.** (2009). “Beyond the experience. In search of an operative paradigm for the industrialisation of services”. *Proceedings SERVDES – First Nordic Conference on Service Design and Service Innovation*, 151-162. Oslo 24th – 26th, November.

**Moritz, S.** (2005). *Service design. Practical access to an evolving field*. KISD (Köln International School of Design). Retrieved from [http://stefanmoritz.com/\\_files/Practical%20Access%20to%20Service%20Design.pdf](http://stefanmoritz.com/_files/Practical%20Access%20to%20Service%20Design.pdf)

**Nisula, J.** (2012). *Searching for definitions for Service Design – what do you mean with Service Design?* Retrieved from [www.servdes.org/wp/wp-content/uploads/2012/02](http://www.servdes.org/wp/wp-content/uploads/2012/02)

Pichlis, D. (2014). *Service Design Tools for Visualising and Prototyping: A Sustainable Meal Case*. (Master thesis, Aalto University – School of Science). Retrieved from [https://www.academia.edu/8594592/Service\\_Design\\_Tools\\_for\\_Visualising\\_and\\_Prototyping\\_A\\_Sustainable\\_Meal\\_Case](https://www.academia.edu/8594592/Service_Design_Tools_for_Visualising_and_Prototyping_A_Sustainable_Meal_Case)

**Rudnicki, J.** (2017). *The Design of Dissent: Graphic for Socio-Political Engagement*. (Master thesis, York University, Toronto).

Retrieved from <https://yorkspace.library.yorku.ca/xmlui/handle/10315/33601>

**Rytilahti, P.; Miettinen, S. & Vuontisjärvi, H.** (2015). “The Theoretical Landscape of Service Design. Design, User Experience, and Usability: Design Discourse”. *4th International Conference Proceedings*. Part I, 86-97. Los Angeles, USA.

- Saffer, D.** (2010). *Designing for interactions, Creating innovative applications and devices*. USA: New Riders.
- Shostack, G.** (1984). "Design Services that Deliver". *Harvard Business Review* 84(11), 133-139.
- Smith, G.** (2007). *What is Interaction Design. Designing Interactions*. Bill Moggridge, VII-XIX. U.K.: The MIT Press.
- Stickdorn, M. & Schneider, J.** (2012). *This is Service Design Thinking. Basics – Tools – Cases*. Amsterdam: Bis Publishers.
- Tyrynopoulos, Y. & Antoniou, C.** (2013). "Factors affecting modal choice in Urban Mobility". *European Transport Research Review* Vol. 5, 27-39.
- Vargo, S.; Lusch, R.** (2004a). "Evolving to a New Dominant logic". *Journal of Marketing* Vol. 68, 1-17.
- Vargo, S.; Lusch, R.** (2004b). "The Four Service Marketing Myths Remnants of a Goods-Based, Manufacturing Model". *Journal of Service Research*, Vol. 6, №. 4, 324-335.
- Zeithaml, P., & Leonard B.** (1985), "Problems and Strategies in Services Marketing," *Journal of Marketing*, 49 (Spring), 33-46. Retrieved from [https://www.researchgate.net/publication/247263456\\_Problems\\_and\\_Strategies\\_in\\_Service\\_Marketing\\_Journal\\_of\\_Marketing\\_49\\_2\\_33-46](https://www.researchgate.net/publication/247263456_Problems_and_Strategies_in_Service_Marketing_Journal_of_Marketing_49_2_33-46)

# CHAPTER 4

## DISCUSSION



Papers from previous chapters are part of my PhD research about a light rail service that operates in Almada since 2009. This innovative service had very high expectations, but poor results in the years that as been working, making the State, its main investor, to urgently re-evaluate the contract with the concessionaire. Going back to the preliminary study of Metro Sul do Tejo and reviewing literature from the City Hall of Almada, this study aimed to analyse the operating results of this transport service and understand its effects on the population and environment, proposing theories to explain the reasons for the low outcome.

The questions we want to answer with this research are:

**What are MST's implications for the life of Almada and in the lives of its inhabitants?**

**How did the design strategy defined for this project influence its results?**

Papers presented in this study outline three different visions about the problem proposed:

**a) Urban Planning/ Demography:** Almada grew without an urban planning. Population density is very high in the centre, but just about 30 km<sup>2</sup> distance, construction becomes sparse, the public transportation network is not efficient, and accessibilities are difficult. Planned to integrate and improve the public transport network, MST addressed the mobility problems from Almada, but considered a demography and user numbers that were never met. During the period of time between its draft and implementation the city's population changed, new important services were built and not upgraded in MST's network.



**b) User feedback:** Civil engineers, environmental engineers, etc. were involved in the project from MST, but its users were only heard in a late phase of the project. We argue that this consultation was relevant to consider problems that could have been solved previously. Users' feedback pointed out concerns which may have influenced the reduced adoption numbers.

**c) Service design** We discuss that the service would have benefit from service design methodology during the project's phase. The usage of design tools and processes could have previously outlined and solved some user problems that were mentioned during this research. There is no evidence of a design strategy involved in the project and this impacted negatively on the service.

## **BACKGROUND**

Almada's urbanization plan dates from the 20th century and it was influenced by functionalism movement, where city spaces with different functions are clearly separated from each other (Bonifácio, 2004).

On its beginning this planning left partially intact rural areas outside the city centre, used for leisure and housing by the upper classes.

With the steady increase of residents in the city (that more than doubled between 1960 and 1981) the city sprawled to the "countryside". This unplanned growth facilitated a dispersed occupation of the land (Carvalho, 2003) but also the increase of housing prices in the centre.

People migrated from distant districts in Portugal towards main cities like Lisbon and Oporto, where the access to employment, schools and services is better. Population came to work in Lisbon, but settled in the outskirts of the city, where housing costs were more favourable.

Speculation on housing prices in Almada and other near cities, sustained the dispersion of residents away from its centre, where prices per m<sup>2</sup> increased. People that work in Lisbon, and especially young families, settled in locations away from the centre of town in search of more favourable living conditions. In the centre remained those who could afford higher or older rents (pensioners or ancient house proprietors). Almada's residents age steadily increased during last years of 20th century, impacting directly on the number of people that stay in the city after work hours and on weekends. This change was not considered in the preliminary project of MST, when statistics seemed to indicate the constant rise of population numbers (INE, 2001).

Active population dispersed in less dense urban areas, impacted also on modal shift and daily voyages towards the capital. *2001's Statistics* (report daily population movements from Almada and near counties (especially Moita and Seixal), of about 17.000 person per day (representing 25 per cent of Moita and Seixal residents) (INE, 2001).

Private vehicles are the means of transportation most used, supporting the usage tendency in the rest of Europe – in Portugal 43 per cent of people use private vehicles, in contrast with 35 per cent that use public transport daily. In 2001 around 140.000 car trips per day were generated in the centre of Almada (INE, 2001).

The exponential rise of inhabitants, caused congestion and pollution problems in Almada, Barreiro and Seixal, which had no time to adapt their structure considering these problems. Public transports do not represent an option to private transports and are pointed out by their poor quality, low frequency, lack of parking facilities in the vicinity of stations or bus stops (Vasconcelos, 2007).

Public transport network in Almada and near counties is constituted by bus, ferry and, after 1999, a train connection on the bridge. *Transportes Sul do Tejo* (TST) and *Barraqueiro*, the bus lines, cover almost all territory, but outside main centres have low frequen-

cy and irregular connections. Due to the lack of urban strategies, most roads are narrow and do not have dedicated bus lanes, and buses are not faster than private vehicles in case of traffic congestion. TST main resource is diesel and with private transport this represents 42 per cent of CO<sub>2</sub> emissions per year (Câmara Municipal de Almada, 2010). Ferry connections towards Lisbon downtown are available in all locations near the river: Almada (*Cacilhas* interface), Barreiro, Moita, Montijo, and Seixal. However, for people working outside Lisbon's centre the ferry is not a good solution, it forces modal shift and increases travelling times.

In 1999, *Fertagus* a train service connecting to regional network, started to operate in the bridge over the river. The train reduced time travel for people commuting to Lisbon, but also reinforced the creation of denser urban areas near its accessibilities and sparse areas inside the peninsula.

In the end of the 1900's Almada is thus a city with a high population density and severe traffic congestion problems, pollution and noise. During the week, traffic on road accesses to Lisbon is chaotic, people spend a lot of time on their daily travelling, and use mainly private transport. Noise and pollution values in the centre of the city and near territory exceed EU recommendations, and available parking places are not enough to the amount of vehicles in circulation.

During weekends and weeks after working hours, the city "is empty" presenting few reasons of interest. In contrast, outside the central territory, construction is sparse, public transportation is inefficient, less employment and services are available.

## **DISCUSSION**

The project of MST aimed to solve mobility problems for people living in Almada and near counties from Lisbon Metropolitan Area (LMA), to reduce traffic congestion prob-

lems witnessed in LMA during 70's to 90', improving the accesses to Almada and Lisbon. It had also the goals of increasing the capacity and quality of public transport, improving comfort for users, reduce pollution levels according to EU directives, following the effort made in Europe after Quioto's Protocol.

The light rail seemed the more interesting solution, and less costly to build once it will circulate in main streets and will not need tunnels like an underground system. Other cities in Europe had similar services with good operative results, raising levels of satisfaction in public transport and reducing CO<sub>2</sub> emissions, traffic congestion and noise. Light rail is a fast, quiet, clean and comfortable service and would encourage the use of public transportation while reducing private vehicle usage. However, the service was unable to achieve the traffic forecast: its user numbers were only 35/40 per cent of what was expected in the preliminary studies.

Information assembled by an Audit Follow-Up held by the State in 2011 restrained the construction of 2<sup>nd</sup> and 3<sup>rd</sup> phases of the project, and only one third of the initial project was finished.

Pursuing the first objective of this research we hope to have produced evidence that some of the problems leading to user's negative perceptions could have been predicted and solved, previously to the service's construction. Others, were unpredictable considering the gap of time between the project and its implementation.

Among the predictable issues we point out:

**1. Construction planning** – the building phase lasted longer than it was expected and impacted severely on the city centre. People's mobility and quality of life was disregarded, due to the lack of organisation and planning.

The centre of town was for four years an open construction site, and many commercial

services closed, forcing people to change their daily routines and shop outside the centre of Almada.

During 2007 people demonstrated against the lack of security, lack of accessibility for pedestrians and dirtiness caused by MST construction (Museu da cidade, 2005b), these demonstrations which were widely shown by the media helped to create a bad perception towards the service.

**2. Network and service outline** – the MST project is from the 90's, and locations like the Shopping Centre *Almada Fórum*, and the Hospital (built afterwards) were left outside the network.

*Almada Fórum* occupies a large area on the outskirts of town centre, it has 260 shops with new accesses and free parking (a facility that was not provided in the centre of Almada, during or after MST's construction). The shopping centre was inaugurated in 2002 and contributed to the commercial spaces displacement, before and during MST's period of construction – 2006/2009.

Almada shop owners demonstrated against its construction arguing that the new commercial space would contribute to unbalance results from local shops (Azenha *et. al.*, 2002), but the shopping centre was nevertheless built.

The tram connects the city centre to *Centro Sul*, which is the nearest stop from *Almada Fórum*, and people have to walk 1,5 km to reach it. This can act as a deterrent factor for a population highly attached to the private transport – Portugal has a pattern of public transportation decline and high private vehicles usage, like in other European countries (European Commission, 2010).

*Hospital Garcia de Orta* was inaugurated in 1991, and built on the edge of the central nucleus of the city, but was also left out of the network. Nowadays the hospital is

served by small local buses that connect it to other locations in Almada (like the train and ferry interface, for instance). The MST station of *Ramalha* is not far from the hospital, but still people need to walk circa 1km to reach it, and the tram is therefore not a transportation choice for the majority of hospital users or workers.

Before the tram service was built, the city centre was located in one of the main squares near cafés and other commercial areas easily reached by foot. MST moved the city centre to the area near the principal tram station *S. João Baptista*, where the greater influx of people occurs everyday.

It reorganised the spaces where people gather, leaving outside locations more frequented before, but these new gathering places were not designed for the high affluence of people. In fact, even if *S. João Baptista* is one of the biggest tram stops in the line, it is not prepared to a large number of users, and has not enough seated places. Also, this tram stop has only 2 ticket vending machines, that were often vandalised and not working, extending waiting times for buying tickets.

MST project is based on a dedicated lane in the street central axis and has no limits in either side of the line, allowing pedestrians to cross the street wherever they want to do it. This caused many accidents when the service started to operate, and was one of the concerns of focus groups' users, who complained about the lack of security on the streets.

**Among the unpredictable factors** that influenced negatively the service's outcome, was the economic crisis that impacted in Europe during the years of 2008-2014. Portugal was one of the most affected countries, and the government restrained investment in health, social and transportation sectors during and after this period.

MST is a public-private consortium and the contract previewed high compensations

to be paid by the State to the concessionaire, if the initial user numbers were not achieved. The first phase of the project, lines 1, 2 and 3 were concluded within the crisis period, between 2008 and 2011, and the State had to pay about seven and a half million Euros per year to the concessionaire. An Audit Follow-up in 2011 concluded that MST project was not economically viable without State support (Tribunal de Contas, 2011), and lead to the suspension of second and third phases of the project, and to the contract renegotiation.

Conclusions from this audit also referred the high passengers' fraud rate – around 25 per cent in December 2010, the line design has an "open" validation system, ticket validation happens inside trams and many people do it only when control occurs.

With only one phase of the project concluded it was impossible to achieve the user numbers initially estimated, with inhabitants of Almada and near LMA counties. MST serves mainly people living in the centre of Almada and it is not an alternative for residents outside the limits of the municipality (like Moita, Montijo and Barreiro).

Ageing of the population that live in Almada was also a factor not considered in MST preliminary study, and difficult to predict on the 90's. Almada showed clear evidence of population growth (in 1981 – 147.690 residents, in 1991 – 151.783 residents) but "younger parishes" locate outside the city centre (Charneca, Corroios, Sobreda, for instance), where the majority of the active people (younger families) live (Câmara Municipal de Almada, 2014). This population who moves daily to work or study and has a regular use of private or public transportation, live in fact in the outskirts of Almada, not covered by MST line.

After the implementation of MST, the City Hall promoted push and pull measures to help to organise traffic and parking in the centre, "giving back" the city to its residents. Squares and streets become pedestrian areas, and parking facilities were built in the

entry of the city and in main arteries, that also have limited residents parking places, outside of which parking is not free. This measure reinforced with strict control and heavier penalties, works as a strong deterrent for eventual transgressors. In spite of positive, the measures lacked a strong information campaign that would have raised awareness about these issues.

Due to the disorganised planning of construction – parking places, for instance, were not ready when MST started to operate, and were only available after 2009-2010.

Residents were unhappy with the dirtiness, traffic change, lack of places to park, and the MST did not consider these negative perceptions.

Nevertheless, satisfaction towards the service was rated with 7.70 and 7.80 per cent, in a scale of 1 to 10 (Tribunal de Contas, 2011). People consider that the service had a positive impact in their lives and contributed to a better territorial planning, but the results from the empirical study presented on chapter 2, pointed out less positive feedback related with service design.

Consultation to users of MST within this work, took place at three different phases: first a user questionnaire was submitted to people in main network stations (*S. João Baptista, Almada, Centro Sul and Pragal*). This was a general questionnaire which assembled demography data and usage habits. Some of the respondents from this first phase were afterwards interviewed in order to complete the information.

The results from this second consultation based two focus groups, where more specific questions about MST were discussed.

Respondents from the first questionnaire are divided among three different age groups: workers aged between 36 and 45 years is the less represented group of users, with only 15.5 per cent of respondents. 26 per cent of users were elderly people with 65 years or older, and 32.5 per cent of respondents were students aged between 16 and 25 years old.



Only 4.5 per cent of respondents came from Lisbon and other locations inside the Lisbon Metropolitan Area, and 28.5 per cent of respondents live in Almada's centre, which was also the destination of the majority of people who answered the survey – 63.5 per cent. From the three lines operating, line 1 is the most used, it connects interfaces from *Cacilhas* (ferry and bus) and *Corroios* (train and bus). This is the longest line from the network with 13,5 km, according to questionnaires line 2 is the less used (*Corroios – Pragal*).

The results from this first questionnaire reinforced the assumption that the majority of MST's users live and travel inside the county. The tram is not an alternative to people travelling from outside Almada towards Lisbon, and user numbers are not representative to raise MST revenues.

A sample from people originally contacted in tram stations were afterwards interviewed and defined five main themes of concern that were discussed in the focus groups. These concerns relate with tangible aspects of the service – ticket vending machines and tram stops, and intangible aspects like service provided, safety and comfort, problems or benefits caused by MST in the city's life.

### **Ticket vending machines and tram stops**

Respondents were not satisfied with the usability of **ticket vending machines**, they reported problems and the fact that they were often vandalised and not frequently checked by MST, does not help their interaction.

Until 2017 riders could only buy tickets on tram stops and MST offices in interface stations (*Cacilhas*, *Almada* and *Corroios*), and the number of available ticket machines on each stop (maximum 2 in main stops) was considered insufficient during peak hours.

Ticket machines were proposed by the concessionaire that won the contract and there

is no evidence that MST users were involved in the testing phase of these equipment, which could have reduced the problems reported, it is our opinion that the negative evaluation from ticket vending machines could have been addressed previously and is the result from a bad service design implementation.

In the third paper of this research we presented design projects applied to the transportation sector, some of them with new solutions for ticket machines and information displays. An example of good service design practices, the Navigo, is a ticket machine developed by Attoma to *Régie Autonome des Transports Parisiens* (RATP) and implemented in Paris. The target from RATP comprehend Paris residents and also millions of tourists that visit Paris every year. This complex target group lead the designers to make extensive user observation, and design workshops to understand and map user needs. This study was made before the system's implementation with the goal of preventing usability errors and problems when the machines were introduced in RATP stations.

In MST project there is no evidence of ticket vending machines being tested with the target group. Due to the fact that these equipments locate outdoors, their exposition to environment (rain, wind, sun) and human interaction (vandalism, bad usage) should have been more carefully considered. Surveillance cameras in tram stops would act as deterrent for vandalism situations and also prevent insecurity in isolated areas. The integration of different payment solutions could also minimize waiting times, allowing passengers to charge travel tickets in ATM machines, by internet or with a digital application could be a solution to reduce the use of ticket machines. (ATM payment was only available to users after 2016).

In case study of Heathrow Express Train (HET) presented on chapter 3, a design team hired by the company developed an application that integrated up-to-date and real time information to the train users.

The purpose of the project was to improve the interaction with the service from users who are not frequent-riders, and with whom HET had difficulties to communicate.

Through context observation, customer journey maps, and touchpoint analysis, the designers assembled important information about HET users and developed an application for smartphones that empowers users in their interaction with the service.

Everyday more services or companies chose technology or digital media to facilitate users' experience and a similar solution could be a good option for MST and would contribute to facilitate user tasks on travel.

**Tram shelters** also received negative evaluation. According to users, tram shelters are not efficient against high temperatures (because they are made of glass) or against the rain or wind and do not provide enough seated places during peak hours (all stops have the same number of seated places, not proportional to their size or importance in the network).

Both equipments, ticket machines and tram shelters, are sensible to weather conditions because they are located outdoors. They should be resistant to environmental conditions as well as to human interaction, bad usage or vandalism.

Tram shelters have space limitations, because most streets where they are located do not allow larger equipments, and their size and number of available seats was restrained.

A solution for this lack of space could be the creation of more places to seat in adjacent shelter areas, protected by trees or other vegetation, which could also be used as places of gathering or rest for residents (Nikolopoulou, M., Linden, J., Lykoudis, S., 2011).

Tram shelters provide inefficient protection against wind, sun and rain according to the focus groups. They have a "bad design", their structure with a narrow ceiling and almost entirely made of glass is not comfortable with high temperatures. Respondents defend that tram stops were projected with aesthetic instead of functional concerns, which

according to studies is effective to attract transit and frequent riders. Aesthetic features are appealing to infrequent or choice riders, not so concerned about the comfort qualities of the shelter because they use them seldom (Zhang, 2012).

The initial goal of MST to reduce the use of private transport and traffic congestion inside the city was not achieved, because people's perceptions were not enough to detach them from their private transportation. Tangible touchpoints and among them comfort in tram shelters should have been better addressed, in the preliminary study.

### **Safety, comfort and MST's staff**

Findings from focus groups reported that the integration of MST in other transportation network, comfort and safety in tram stops, and inside trams could be improved.

People complained that MST is not efficiently integrated in Almada's transportation network. MST needed a dedicated ticket and only recently has been included in a system used by other transports in Almada and Lisbon. This integration allowed the service to commute with others but the lack of coordination between different service timetables (bus, train and ferry) was not solved and, transports are not interchangeable (the same ticket can not be used by tram and bus inside the same route, for instance). In 2018, after 9 years of operation, this is still not solved and people need to buy different monthly cards for *TST* (bus), *Fertagus* (Train), *Transtejo* (Ferry) and MST.

In the survey conducted within this study people also complained about safety and comfort from tram stops.

Respondents from the questionnaire and focus group reported the lack of safety for users on isolated tram stops that are less frequented outside peak hours. People referred situations when they felt unsafe, inside the tram or on tram shelters, and suggested that this could be solved with more police control or surveillance cameras.

MST preliminary study considered aspects of the light rail related with design and infrastructure (previewing the territory that was necessary to reorganise, structures to be considered, engineering project, environmental impact studies, user number studies), but still on a theoretic perspective (Município de Almada, 1996). User numbers were hypothetical and based the disadvantageous contract between the State and the consortium that explores the line. This preliminary study was not upgraded (considering the distance between its draft and conclusion) and the discussion about the project's implementation proved to be insufficient – problems caused by MST's construction were not safeguarded, tangible aspects of the service were not tested (ticket machines, tram shelters).

During the empirical study, respondents also complained about the way service was provided and specifically about staff performance. The contact with MST's staff occurs in very specific situations: in ticket selling points, that as referred before, exist only in main transport interfaces (Almada, Cacilhas, Corroios); with tram drivers, and ticket controllers.

Users can purchase tickets and monthly passes in the ticket selling points, and this is the only occasion when they don't use a ticket selling machine. They can also ask for information, tickets, cards, etc. with the intervention of staff.

Inside trams the contact with tram drivers is very limited. The driver cabin is closed to the rest of the public. Users sometimes address the driver to get informations about traffic, but these situations happen rarely and mostly when the tram is stopped for longer periods of time.

More frequent Interaction with staff happens with ticket controllers. Due to high fraud rate, during the first years of the operation, control in the line happens frequently. People who do this work do not wear MST uniform, they are outsourcing. Participants

from focus groups complained often about the service provided by ticket controllers. Their performance, in what concerns competence, behaviour and education/training in contact with public, was evaluated as Very Bad.

They also received scores of Very Bad on visual aspect and education.

Respondents complained that the people performing this work were very impolite and sometimes even aggressive towards customers.

These bad experiences with the service contributed to its dehumanised and negative image. Interaction points like machines and displays, are often not working and employees are rude and not behave adequately with customers.

In the case study of London Underground, presented on chapter 3, a big effort was made with the aim of providing solutions to improve interaction between the service and its users. The design team involved in the study concluded that a face-to-face approach, with staff directly interacting with customers would solve problems that people frequently have on the underground stations (lack of information, what ticket to buy, which line to use, timetables, etc.). This solution helped to improve efficiency of the London Underground and also raised levels of satisfaction and awareness towards the service. Live|work, the design company involved in this study, based conclusions on intense customer and staff behaviour observation and reshaped customer service according to modern service parameters.

MST line has not the same complexity as the London Underground line, however integrating similar solutions in main stations or interfaces, for instance, would probably improve interaction and solve partially the problems with machines. It would also help to give a humanised image of this service, raising customer satisfaction and loyalty towards it.

All the questions reported contribute to our opinion that the companies and public

services involved in the development of MST, failed to consider the human factor – the user-centred perspective.

MST preliminary study integrates an economic reality based on a financial assumption, which had ceased to be viable. This situation was not measurable and was unforeseen, but the major failure of this service was to not consider the user perspective, an element that can not be equated solely with demographic or economic feasibility studies. We defend that the consultation with the users of the service was mediocre. There is no evidence of an observation phase, or application of design processes, in order to understand user expectations regarding MST.

The work was carried out after the implementation of the service and had a very limited impact on its design. Satisfaction surveys conducted annually by the company on a sample of MST users, are an important tool for assessing perceptions and solving complaints, but do not change structural problems.

We argue that the project and implementation of Metro Sul do Tejo lacked design strategies and this is also one cause for its “failure”.

### **Design strategy**

What is the purpose of using design methodologies in a service like the MST?

The inclusion of designer teams in the creation of projects allows the integration of multidisciplinary skills / work processes that are inherent to design thinking and specific from the design field.

Design methodologies are based on iterative processes, allowing deep observation and reflection on the proposed problems (Holmlid, 2010).

Before projecting, or even considering solutions to a problem, the designer or team contact with people from the community, potential users and other stakeholders whose

perceptions are determinant to frame an idea. This is an immersible phase, it can last more or less according with the project's complexity, and prepares the design team to deal with all the variables from the problem.

With the case studies presented in chapter 3, we intended to put in evidence good practices that incorporated reflexive methodology that minimize bad results. All stages from design methodology are relevant, but without observing and reflecting about a problem, a project will not incorporate knowledge and solutions that were previously tested, or its users and stakeholders feedback/perceptions.

MST preliminary study considered future users based on demographic and mobility studies, the choice of the light rail system aligns with directives from the EU which proved to work in other countries, but left outside the real social environment from Almada. The model created was mostly based in political parameters required for the project approval. In the case studies presented, all solutions were discussed in an early phase of projects, allowing not only direct interaction and user observation, but also the test of solutions before their implementation. Design processes applied to services allow teams to evaluate, test and refine solutions grounded on real perceptions, meaning that the final options for design problems will be more accurate and adapted to the target in question, not only framed upon theoretical assumptions.

MST project has no evidence of this exploratory / testing phase, all the evaluation work and user satisfaction studies were made after the implementation of the service, revealing problems that were not considered in the project phase.

The City Hall of Almada held open forums to assemble opinions and perceptions towards the service during the years of 2004 and 2005, (Museu da Cidade, 2005a), but a design methodology more extensively applied to the project could have minimized the negative questions reported in this research.



The entities involved in the project seemed to have forgotten its complexity and variables, service is affected by human behaviour and the experience provided is not always the same.

This complexity is the biggest challenge for designers that work in the field of service design. They do not only deal with innovative technology or creative procedures, they should also consider human variables, less easy to measure.

Even with its young history, service design has been innovating concepts that are supported with extensive research. The contributions the field received from other disciplines helped it to project its intervention and attract the interest of private companies from the tertiary sector, but also from public entities that realise the importance of improving tasks and processes in the service they deliver to users.

In the last paper of this research we asked service designers feedback about their profession, designers were very clear about they main fields of concern. It is interesting to see that even with new technologies and faster processes, the core of design, the problems and worries of designers remain. These concerns relate with ethics, engagement, and sustainability.

Sustainability means low impact on the environment with adequate use of resources, optimizing people and tools needed to address a problem.

Communicating accurately the purpose of the project, helps to define its perimeter and shape levels of intervention. The final goal is a better understanding of customer expectations, addressing them with sensitive models that can transform organizational structures and experiences – MST changed insights about public transport in Almada, but was not able to fulfil user expectations.

For designers the lack of awareness about service design pushes companies to find solutions based on old processes using new technologies, but disregarding client real

needs. Citizens should be involved in projects, but designers refer that companies are sometimes more interested in using “old-fashioned techniques” like focus groups, than collaborative processes. This is even more sensible with political issues; results from the collaborative process can be unpredictable, and not according to political decisions.

During the collaborative stage of this project, users’ feedback did not impact on decisions, in our opinion its aim was just to gather public agreement, support for the project. Open forums held by the city hall presented the service and allowed discussion about it, but structural decisions were already made, and user’s impressions did not change final solutions.

Designers stressed the importance of design tools and prototyping, as a way of visualising complex information and receive feedback about it.

Service design is a consistent methodology and should not be sold as a technological feature, designers have to acknowledge the impact of their work, their engagement with the society and values they represent or “translate” for users is a relevant work and can influence opinions or promote change.

Their aim and the purpose of service design should be above consumer society, and even if designers work for corporations, they should be aware of their “power”, as influencers and paradigm changers.

The entities involved in the project of MST failed to identify and incorporate the social dimension of this service, basing its choices on economical studies that allowed them to approve the project. The weaknesses of the service and the problems it faces nowadays are the results of a incomplete project, that strongly impacted in the life of Almada.

It will be difficult, in the near future, to solve the service’s structural problems, but we hope that with the improvement of the country’s economic conditions and reinvest-

ment on the transport sector (which has already been announced for the 2019 government budget), there will be a willingness to complete the line, according to the initial MST project.

Negotiations to review the contract between the concessionaire of the MST and the State, in order to make it less burdensome for the latter, are still underway. Seven years after the MST Audit Follow-Up, the state continues to pay the consortium, large compensatory sums, due to the fact that user number from the initial forecast are not reached. Despite its difficulties, MST has the value of having been the first light rail line to be implemented in Portugal. After nine years since its inauguration, the centre of Almada seems to be emerging from its lethargy, with the opening of new commercial services, restaurants and leisure areas that will bring more people to the city.

## REFERENCES

**Azenha, A. S.; Fernandes, D.; Marques, R.** (2002). "De olhos postos em 20 milhões de clientes". *Correio da Manhã*, 15.09.2002. Lisboa.

**Bonifácio, A.** (2004). *Almada "Waterfront". Contributos para síntese da evolução do espaço público urbano. Espaço público e regeneração urbana: arte e sociedade.* UN Barcelona, Barcelona.

**Câmara Municipal de Almada** (2010). *Estratégia Local Para as Alterações Climáticas do Município de Almada.* Câmara Municipal de Almada (Eds.). Almada.

**Câmara Municipal de Almada** (2014). *Território e População. Retrato de Almada segundo os Censos 2011.* Câmara Municipal de Almada (Eds.). Almada.

**Carvalho, J.** (2003). *Ordenar a cidade.* Quarteto Editora, Coimbra.

**European Commission** (2010). *EU Energy and Transport in figures. Statistical Pocketbook.* Retrieved from Internet: [http://ec.europa.eu/energy/publications/statistics/doc/2010\\_energy\\_transport\\_figures.pdf](http://ec.europa.eu/energy/publications/statistics/doc/2010_energy_transport_figures.pdf).

**Holmlid, S.** (2010). "Service design and product-service systems". Proceedings CIRP IPS2 Conference 2010, 195-202. Linköping University, Sweden.

**INE – Instituto Nacional de Estatística** (2001). *CENSOS 2001. Resultados Definitivos* Lisboa. Retrieved from [https://www.ine.pt/xportal/xmain?xpid=CENSOS&xpgid=ine\\_censos\\_publicacao\\_det&contexto=pu&PUBLICACOESpub\\_boui=377711&PUBLICACOESmodo=2&selTab=tab1&pcensos=61969554](https://www.ine.pt/xportal/xmain?xpid=CENSOS&xpgid=ine_censos_publicacao_det&contexto=pu&PUBLICACOESpub_boui=377711&PUBLICACOESmodo=2&selTab=tab1&pcensos=61969554)

**INE – Instituto Nacional de Estatística** (2011). *CENSOS 2011.*

**Município de Almada/ Câmara Municipal de Almada** (1996). *Ante projecto para o Metropolitano Ligeiro da Margem Sul do Tejo.* Almada.

**Museu da Cidade** (2005a). *Mobilidade em Almada. Dossiers de informação*. Câmara Municipal de Almada (Eds.) Centro de Documentação – Museu da Cidade, Almada.

**Museu da Cidade** (2005b). *Transportes em Almada: a evolução dos transportes em Almada. Dossiers de informação*. Câmara Municipal de Almada (Eds.). Centro de Documentação – Museu da Cidade, Almada.

**Nikolopoulou, M., Linden, J., Lykoudis, S.** (2011). "Pedestrians' perception of environmental stimuli through field surveys: focus on particulate pollution". *Science of the Total Environment* 409 (13), 2493–2502. Retrieved from <http://www.researchgate.net/publication/51051133>

**Tribunal de Contas** (2011). Auditoria de seguimento à concessão Metro Sul do Tejo, Tribunal de Contas (Eds.). Lisboa. Retrieved from: [http://www.tcontas.pt/pt/actos/reL\\_auditoria/2011/2s/audit-dgtc-rel022-2011-2s\\_1.shtm](http://www.tcontas.pt/pt/actos/reL_auditoria/2011/2s/audit-dgtc-rel022-2011-2s_1.shtm)

**Vasconcelos, C.** (2007). *Projecto Metro Sul do Tejo – 12ª Reunião Intermédia de Comités Técnicos da ALAMYS – Sessão Plenária*.

**Zhang, K.** (2012). *Bus station urban design. nine techniques for enhancing bus stops and neighborhoods and their application in metro Vancouver*. Thesis for the Master Degree of Arts. University of British Columbia.

# CHAPTER 5

## CONCLUSION



The subject of this research is Metro Sul do Tejo, a light rail service that operates in Almada since 2009.

In spite of the innovative project and high expectations, from the entities involved in its development, the service initial goals were never achieved.

Result of a public-private consortium, clearly disadvantageous for the state, the line construction was suspended after several years of negative results.

In this work we analysed different hypothesis for the service's low performance, showed by a high fraud rate, reduced user numbers, negative user's feedback about the experience provided.

We hope to have answered to this thesis' questions pointing out different causes for the service problems, which were not considered in the preliminary study: urban plan of Almada and its impact on mobility of its residents; demographic changes in the population and the non-renovation of younger and active people living in the city-centre; the economic crisis that severely impacted on the service implementation and forced the suspension of lines 2 and 3 from initial project; the absence of design strategies that limited the tangible and intangible aspects of the service provided.

In the course of this work we presented other service design projects, applied on transportation, as an example of good design practices. Our intention was to infer that the application of design tools and processes is relevant to minimize errors, improve users' feedback and loyalty towards a service. The review of these projects was also valuable to ground the suggestions made to MST, complemented with feedback from service designers working mainly in Europe, who shared their reflections about the field and the difficulties they face.



Lastly, considering the scarcity of academic research about service design in the transportation sector, we hope that this work contributes to raise awareness about the subject, thus cultivating the conversation on the need of better public transportation and mobility's user-centred solutions.

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