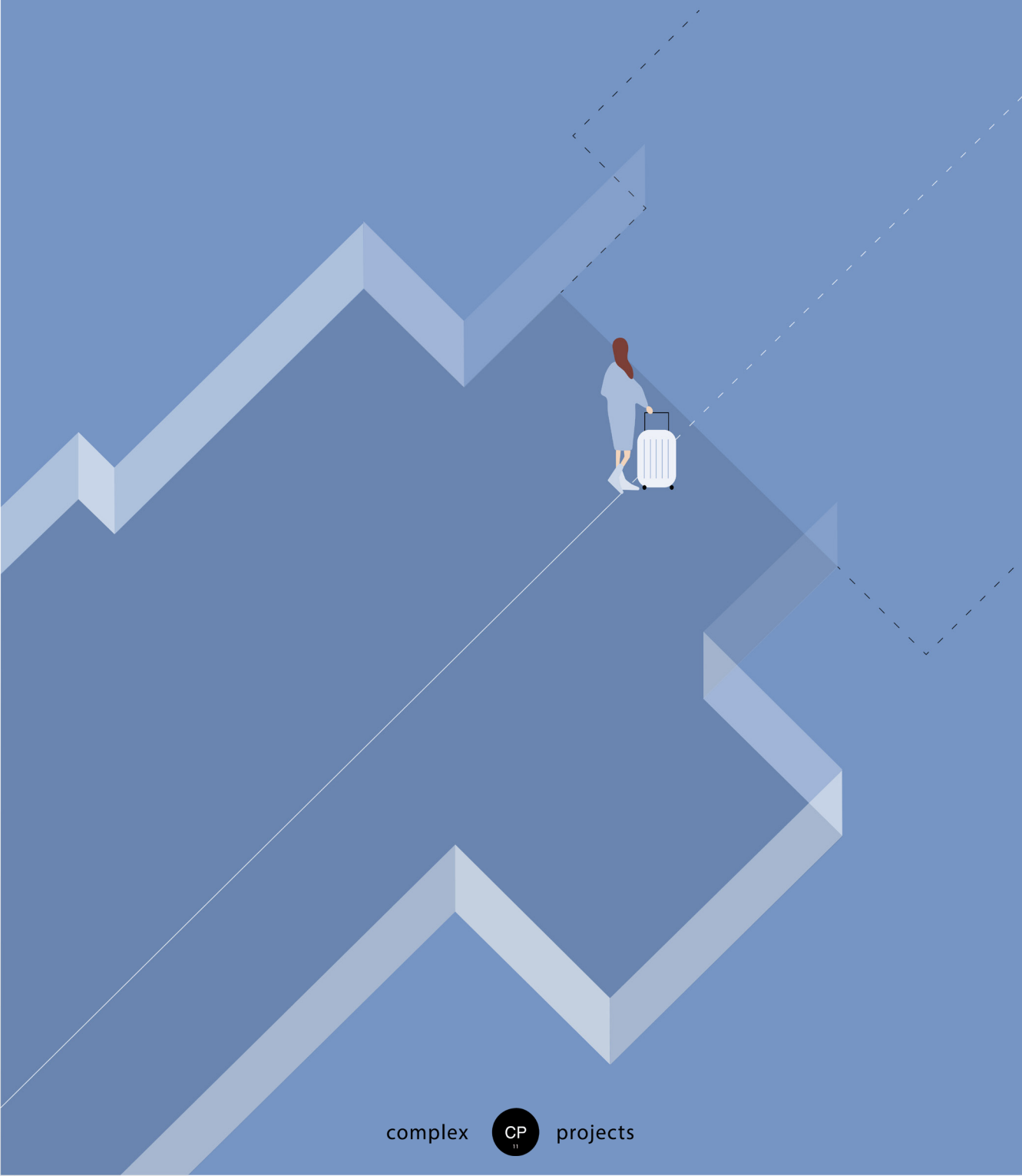
SELF-NAVIGATING AIRPORT

An airport made for comfort



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Health

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INTRODUCTION

01

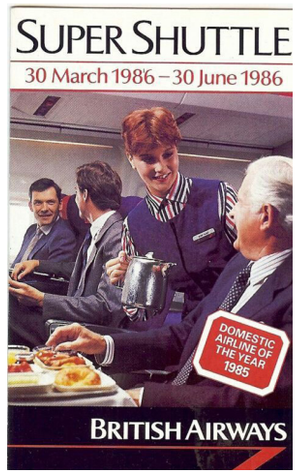
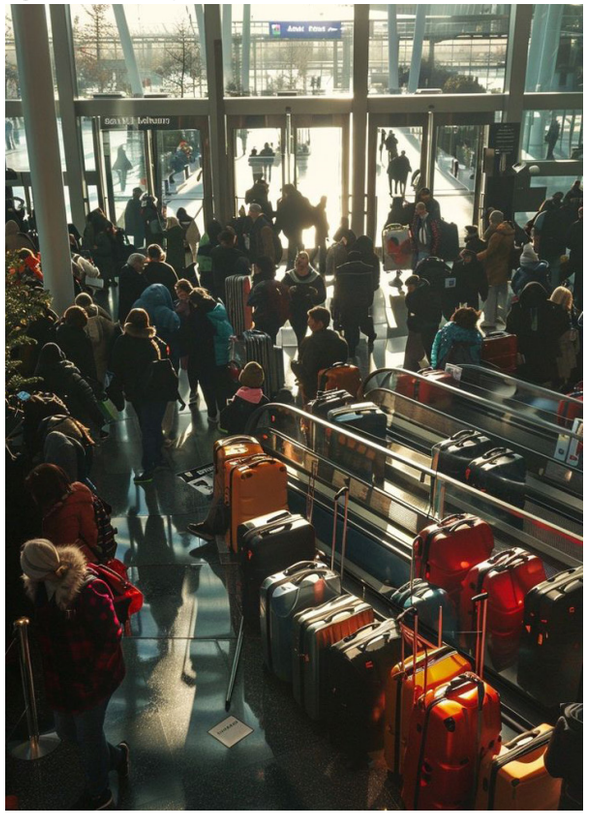


Fig 1,2,3: old airline promo

Fig 4: old airport interior



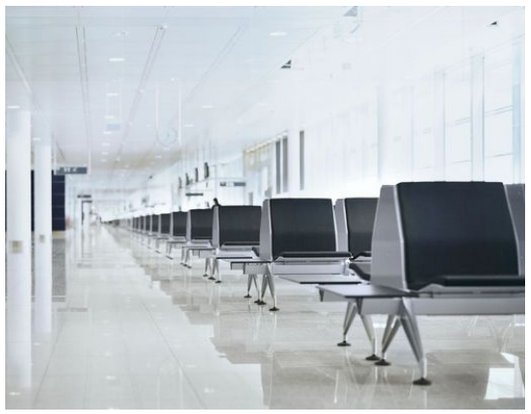


Fig 5,6,7: curent airport

Problem Statement

The first airports as we know nowadays came up in the 1930s as a gateway between land and air (Nagy, 2012). It was a place of wonder, meant to showcase and admire the novelty of air traveling, inspiring feelings of excitement and anticipation for new adventures (Smith, 2018). Both the airlines and the airport design promoted comfort, luxury, convenience, and fast travel to exotic destinations. This celebratory attitude around flying has been lost through time through a series of dehumanizing processes and procedures. The airport has evolved from a place of comfort, luxury, and excitement to a stressful, mass-processing machine, with overwhelming crowds, claustrophobic and confusing spaces, an overstimulating environment, and an authority feeling. The luxurious bars became the fast-food chains, the comfortable couches, and carpeted floors became plastic chairs and grey walls, and the welcoming atmosphere became infinite queues and crowds. The focus on mass processing and increased profits has stripped these buildings of any humanizing elements, forgetting to differentiate between processing luggage or passengers. For passengers, the airport experience has been minimized to passing through the terminal as quickly as possible, due to a lack of incentive to linger or even visit at all. Just a few of the elements that contribute to this are uninspiring interior designs, crumbling infrastructure, claustrophobic spaces, security hassles, and a lack of access to food, shops, services, and entertainment (Nagy, 2012).

On top of this, the increased security requirements generated by 9/11 as well as the growing number of people and cargo that needs to be processed has put increased pressure on the airports as a system. The modern airport has become a puzzle of many parts, each with its respective functions and procedures in processing the passenger and cargo from land to air. This has influenced the journey through the modern airport to evolve into a relatively dehumanizing process that lost its connection with the emotional and mental needs of the passengers, leading to the experience of stress (YEUNG, 2021).

The increasing competition between airports has led to growing pressure on airport managers to attract more passengers and airlines by providing a desirable airport experience. There is a growing understanding of the influence that the airport experience has on travel experience and satisfaction, the generated non-aeronautical revenue of airports, the competitiveness of the airports, and the loyalty of the passengers and airlines in choosing their transit hub (Amir Batouei, 2020).

Thesis topic

This thesis intends to analyze how can the stress in airports be reduced and what is the contribution of the architecture in this discussion. It investigates what influences the airport experience, what generates positive and negative reactions in passengers, what is airport service quality composed of, and what architectural elements can raise its levels. The goal of this paper is to determine what architectural topics influence air travel stress and how they can be further investigated through designing a prototype of an airport in Linate, Milan where the conclusions of this paper can be tested.

Research question

How can the design of an airport reduce stress and improve the level of service quality with the end goal of improving passenger experience?

Definitions:

Reducing stress: refers to the actions or strategies adopted to lower physical, mental, or emotional tensions and alleviate feelings of anxiety or pressure experienced by the passengers.

Airport service quality: refers to the overall standard of services and facilities provided in an airport and the degree to which it meets or exceeds the expectations and needs of the passengers.

Passenger satisfaction: is an inclusive reaction to a perceived difference in one's expectation and their perceived impression after use (Cronin Jr, 2000)

Passenger experience: encompasses the events encountered in the entire journey from the moment they start planning their trip to the moment they reach their destination.

This question explores how airport design can be used to transform air travel into a more pleasant and comfortable experience that considers the physical and psychological needs of the passengers.

The research will analyze various reference projects from different countries but will take into account factors and rules specific to the location of the site which is Milan, Italy.

RESEARCH FRAMEWORK

02

Theoretical framework

The theoretical framework of this research is based on Fodness and Murray's model of airport service quality expectations which divides it into three preliminary dimensions: servicescape, service personnel, and services, each of them being further divided into three subdimensions explained in the next chapter (Dale Fodness, 2007). Following Fodness and Murray's definition, the servicescape dimension is based on Bitner's conceptual framework about the impact of the physical surroundings on the behavior of both customers and employees (Bitner, 1992).

Another key aspect of the research is determining the aspects that influence the passengers' perception of airport service quality. This information is taken from various sources that conducted qualitative research on samples of airport passengers. The main one is Fodness and Murray's list of 65 airport service quality themes (Dale Fodness, 2007) that was generated through in-depth interviews, focus groups, and content analysis of verbatim comments on passengers' expectations.

Fig 8: Airport Service Quality diagram (own work)

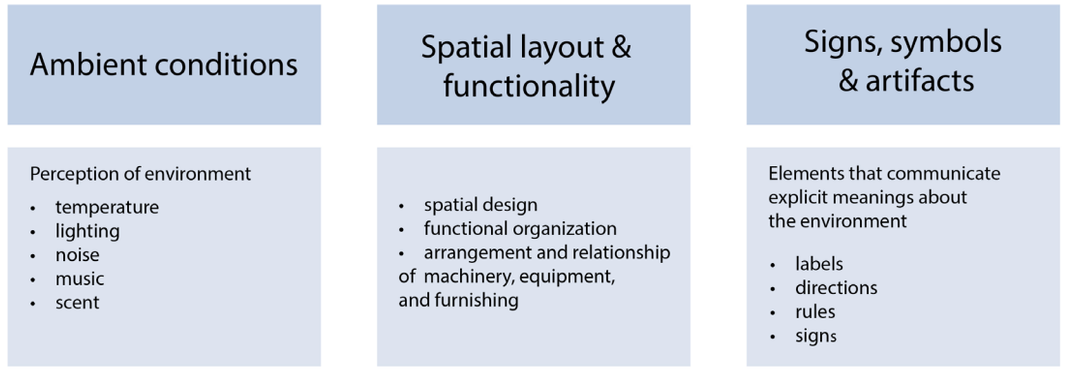


Fig 9: Servicescape diagram (own work)

Theoretical argumentation

The demanding nature of air travel can provoke air travel stress in persons who would not normally experience stress (Bricker, 2005). Air travel stress can manifest as acute stress (a short-term stress that comes and goes triggered by a certain situation) and it can have physical reactions (i.e., a racing heart, headaches, dizziness, shaking, high blood pressure), psychological symptoms (i.e., anxiety, irritability, panic attacks), or behavioral symptoms (i.e., substance use like alcohol and smoking or impulsive shopping or eating) (Cleveland Clinic, 2024).

The main reason that makes air travel stress distinct from other forms of transit stress is the lack of autonomy and control that characterizes this environment (when the basic goal is to transit safely and comfortably from one location to another can be compromised by many uncontrollable situations) (Bricker, 2005).

To comprehend all the elements that cause air travel stress, this study uses Fodness and Murray's Airport Service Quality model that divides it into three dimensions: servicescape, service personnel, and services.

Bitner (1992) refers in her studies to servicescape as the physical environment and categorizes it into three subdimensions: ambient conditions, spatial layout & functionality, and signs, symbols, & artifacts (Bitner, 1992). Ambient conditions refer to factors that influence the perception of the environment (i.e., temperature, lighting, noise, music, scent). Signs and symbols are the elements that communicate explicit (i.e., posted labels, directions, rules, signs) and implicit (quality of materials, design, furniture, colors) meanings about the physical environment. Lastly, spatial layout and functions refer to spatial design, functional organization, and the arrangement and relationship of machinery, equipment, and furnishing (Dale Fodness, 2007). Bitner (1992) explains that customers' and employees' internal (cognition and emotion) and external (staying and revisiting) responses can be

Fig 10: stressors encountered by the passenger on their way (own work)

influenced by all the measurable physical factors that can be controlled by the service firm (Smith, 2018).

The service personnel refer to the employees of the airport and airlines, their attitudes, behaviors, and expertise (Smith, 2018). From the perspective of this thesis, the service personnel do not present an area of interest since it cannot be influenced through the architecture. The same goes for the services which are divided into productivity, maintenance, and leisure (Dale Fodness, 2007).

Air travel stress can generate three types of reactions: anxiety towards adverse air travel events, anger towards other passengers or staff members, and lack of trust in the airport and the airline's capability to ensure their comfort and safety (Bricker, 2005). Anxiety is a negative emotional response that can result in a decrease in customer satisfaction (John Gountas, 2007). In mild cases, anxiety can reduce the joy of travel and cause physical and mental exhaustion, while more severe cases can cause social and professional impairments (Amir Batouei, 2020). Air travel anger can result in hostile thoughts, angry affect, aggressive intentions, and physiological arousal (Bricker, 2005). The lack of trust in an airline or airport has a significant impact on airport experience since a passenger can experience distress while in transit if they believe that their safety and comfort are not satisfied (Bricker, 2005).

The focus of this study is the passengers' experience from entering the airport to boarding the plane since this journey is made through a series of areas, each with its unique requirements and different stress levels induced. The North America Airport Satisfaction Study by JD Power and Associates identified six terminal elements as crucial factors influencing airport passengers' satisfaction: accessibility, security check, baggage claim, check-in/baggage check, food & beverage concessions, and retail (Smith, 2018). Research shows that security screening procedures and inefficient airport facility layouts are the main sources of passengers' dissatisfaction. Additionally, poor security processing procedures, long queuing lines, and too little or hard-to-read signage can threaten an otherwise positive passenger experience (Bogicevic, 2013). Other studies have shown that travelers' anxiety increases from the moment of entry into the airport till its peak during security and passport control and begins to diminish only after all the processing stages have been cleared (Sickert, 2011). Another study from Rendeiro Martin-Cejas (2006) shows that passenger satisfaction is positively influenced by well-executed check-in procedures and shorter waiting times (Smith, 2018)

Global, Architectural and Studio Relevance of the topic

First of all, passenger satisfaction influences the volume of tourists visiting Milan and their opinion of the city. Airports are considered a representation of the destination in travelers' minds since they are the first and last place visited on their trip. (W. Wattanacharoensil, 2016) indicate that the travelers' negative experiences can influence their perspective on the destination, going as far as to influence the decision to return or not to the respective destination (Amir Batouei, 2020). Furthermore, since airports are major infrastructures in the transportation industry and they are significantly contributing to a nation's economy, their performance can have an impact on regional development and tourist attractiveness (Amir Batouei, 2020). As such, airports can be considered near-destination links that contribute to the development of tourism in the region where they are located (George C.L. Bezerra, 2019).

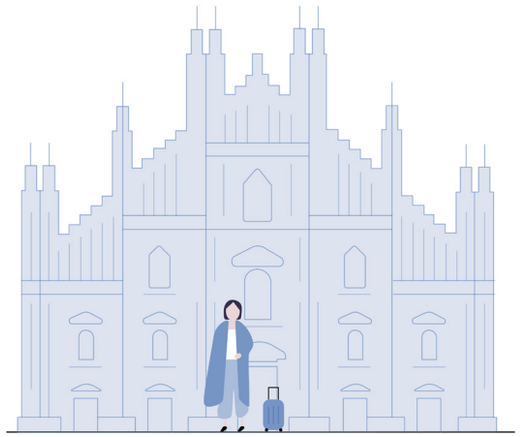


Fig 11: relevance to Milan (own work)

As for the airport, increasing competition among airports worldwide has driven managers to attract more passengers and airlines, aiming to boost both aeronautical and non-aeronautical revenue (Smith, 2018). There is a growing understanding that a desirable Airport Experience can improve a travel experience, increase passengers' satisfaction and non-aeronautical revenues, elevate airport competitiveness, and influence the travelers' and airline's choice of airport in an area where there are multiple transit hubs available (as is the area of Milan) (Amir Batouei, 2020). Aviation publications and press releases show that airport managers recognize the importance of passenger satisfaction, prompting renovations, improving retail and dining, and adding a better flow management to enhance service quality. These types of modernization efforts are essential, as passengers' impressions of the airport's physical environment impact their perceptions of the quality of service provided (Smith, 2018). A satisfied passenger spends 45% more than a disappointed one (Smith, 2018) and has a higher intention of spreading positive word-of-mouth, as well as returning to this airport over other airports in the region (Amir Batouei, 2020).

Fig 12: relevance to Linate (own work)

Overall, this research will provide insight into designing efficient mobility hubs, focusing on movement flows and spatial organization for large crowds. The findings can be applied to a variety of high-traffic environments, including airports, train stations, stadiums, and other public venues. By addressing how people navigate and interact within these spaces, this study seeks to inform design strategies that improve crowd flow, reduce congestion, and enhance user experience across diverse architectural settings.

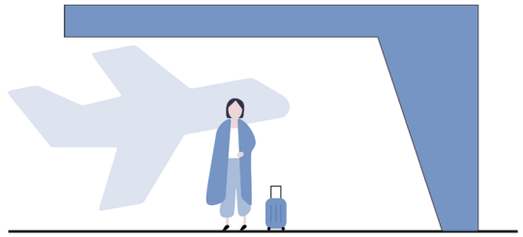


Fig 13: relevance to airports (own work)

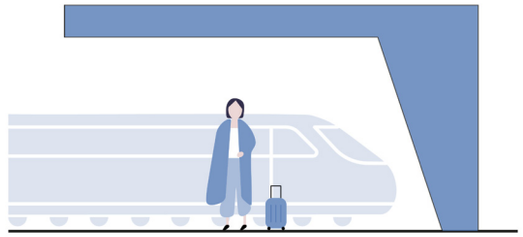


Fig 14: relevance to train stations (own work)

Fig 15: relevance to stadiums (own work)

RESEARCH METHODS

03

Linate airport

The topic will be investigated by redesigning the Linate Airport in Milan, Italy. Linate is one of the three airports that form the Milan Airport System together with Malpensa and Bergamo.

The site is located 8km from the center of Milan and is connected by metro and bus to the city center. Currently, it has two runways, 41 aircraft stands, and a terminal size of 70 000 sqm with 24 boarding gates and 71 check-in desks. The main clients are SEA and Milan Municipality.

For the next step of the research, the current program will be reevaluated together with the urban and socioeconomic context to determine if any changes should occur. The result will be a detailed design brief that will then be developed into a design proposal. The goal is to test through the design proposal solutions for improving the airport service quality with the final design serving as an architectural example that can be inspired from and implemented in various other airports or mobility hubs.

From the research showed above, seven topics of interest have been created to be further analyzed through the design process. They are a result of Fodness and Murray's list of 65 airport service quality themes combined with findings from various other research papers to create a comprehensive list of elements that have an influence on the airport experience and that have been categorized in the Airport Service Quality division. The full list is attached in Appendix X.

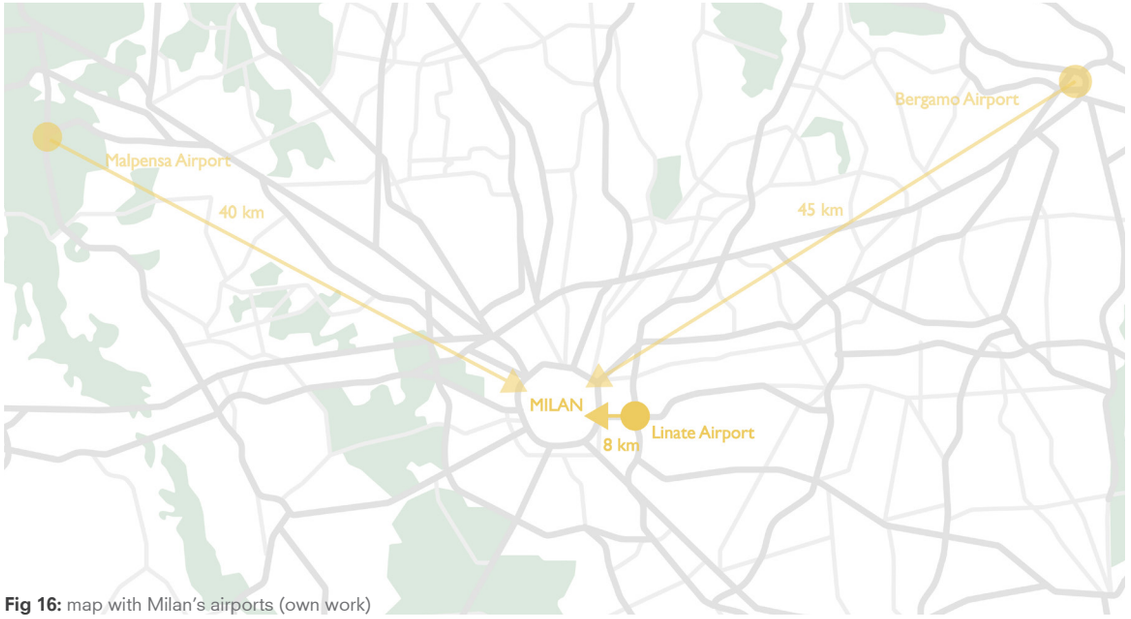


Fig 16: map with Milan's airports (own work)

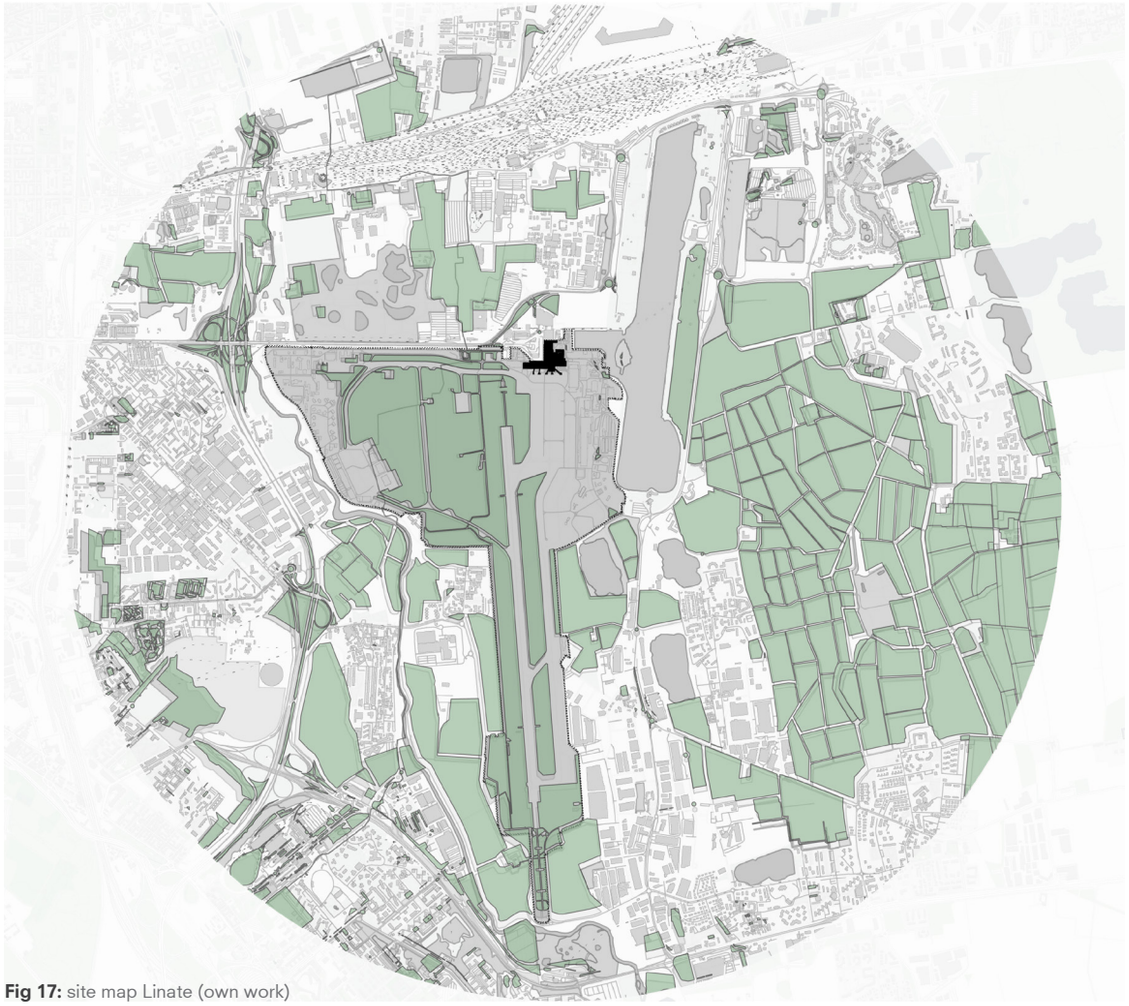


Fig 17: site map Linate (own work)

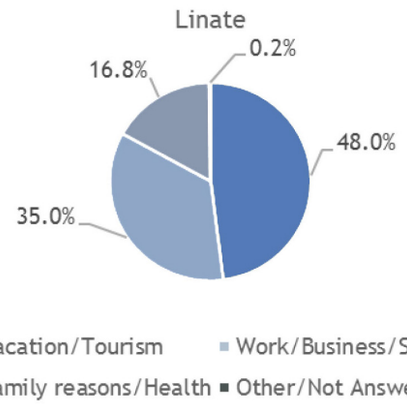


Fig 18: passengers' reasons to travel in Linate (SEA 2018)

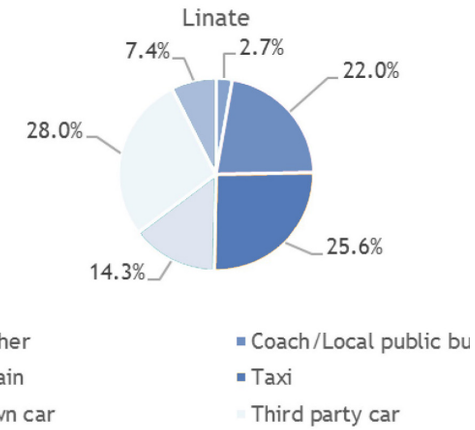


Fig 19: passengers' ways to travel to Linate (SEA 2018)

Seven research topics

The primary topic is Wayfinding, including floorplan layouts, routes, flow of people and signs. This topic is prioritized since wayfinding consistently emerges as a key factor in studies on airport stress and service quality. The author will analyze floorplans of airports with various user feedback, to asses layout functionality and route clarity. User feedback and interior photographs will provide firsthand insight into passenger's experience. Research on wayfinding in public spaces and airport terminals will further enhance understanding of this essential topic.

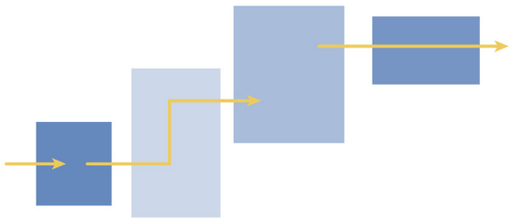


Fig 20: clear flow diagram (own work)

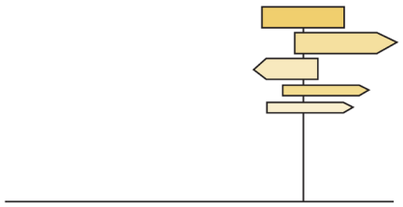


Fig 21: clear signage diagram (own work)

Fig 22: short commute diagram (own work)

The second and third topics are a natural continuation of Wayfinding, focusing on Diminishing the crowds and Returning agency to the user. Diminishing Crowds addresses congestion by examining how layout, signage, and function placement impact crowd flow, aiming to understand what causes people to stop and how design can alleviate bottlenecks. This expands the initial flow research by analyzing elements like furniture, spatial layout, and signage in congested areas.

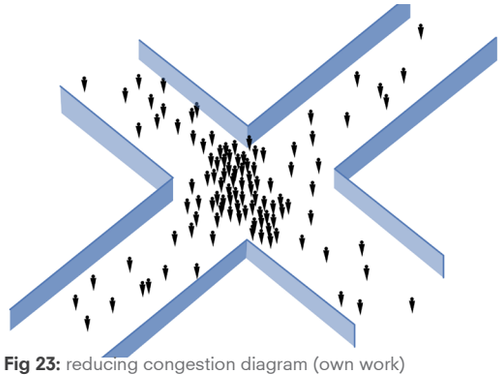


Fig 23: reducing congestion diagram (own work)

Returning agency to the user come from the findings of Yeung that the main reason for air travel stress is the lack of autonomy (in movement, path, speed) (YEUNG, 2021). Recognizing diverse passenger needs (from quick transit to leisurely exploration) this topic will investigate traveler types through surveys to design adaptable layouts and flows that allow each type of passenger to choose their preferred experience.

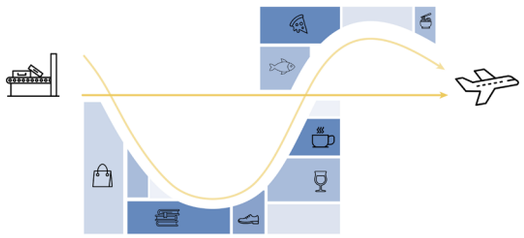


Fig 24: returning agency to the user diagram (own work)

The fourth topic is Ambience focuses on minimizing overstimulation in terminals by managing ambient factors like temperature, lighting, sound, and scent. This topic will involve an in-depth review of various studies and analyses of existing airports, supplemented by user interviews, to identify sensory issues in the ambient environment.

Fig 25: reducing overstimulation diagram (own work)

The fifth topic, Functions, also draws on passenger interviews to identify necessary amenities like shops, dining, relaxation, and entertainment areas. Based on survey data and floor plan analysis, this section will suggest optimal placement and spatial arrangements for these functions within the terminal layout.

Fig 26: functions diagram (own work)

The next topic covers Aesthetics, encompassing design elements that enhance comfort, beauty, and character in space. This will involve analyzing reference projects and reviewing surveys and questionnaires to identify preferred materials, colors, greenery, furniture types, and spatial arrangements.

Fig 27: pleasent design diagram (own work)

The final topic addresses a common issue in current airports: Humanizing the Airport. This analysis focuses on creating user-centered spaces that make travelers feel valued rather than part of a mass-processing system. It will draw on analyses of traditional airport designs, examples of modern luxury spaces, and insights from relevant research papers.

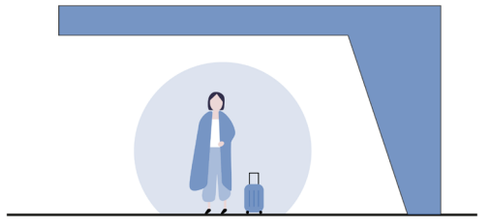


Fig 28: humanizing the airport diagram (own work)

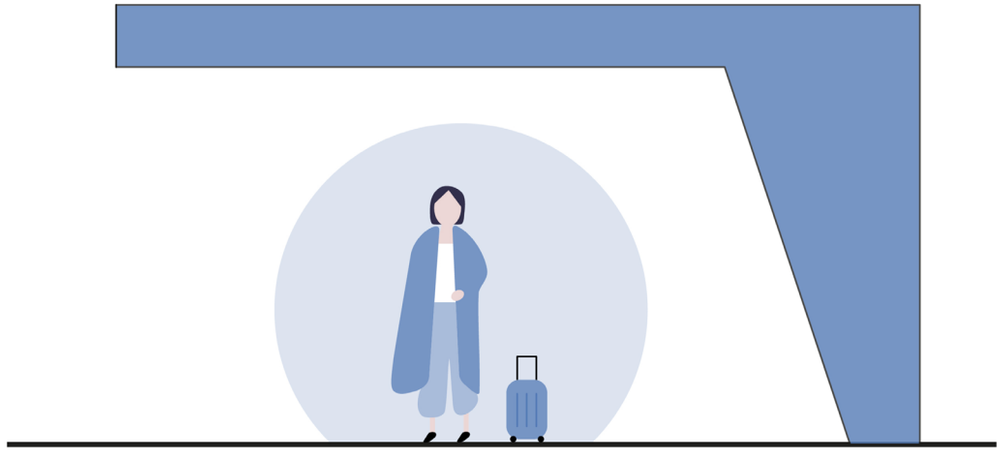
CONCLUSION

04

Conclusion

The design assignment will constitute of an airport prototype that will focus on transforming the air travel experience into a more human cantered process, reducing the levels of stress and anxiety and overall increasing the service quality provided to the passengers. The research will conclude with a design proposal for a new Linate airport in Milan, that will investigate the seven topics mentioned in the previous chapter. The goal is to create an airport that:

- Has an easy and clear wayfinding
- Has a layout that reduces the walking and waiting time and diminishes the congestion areas
- Provides all the necessary functions to increase the passenger satisfaction
- Has a pleasant, comfortable and relaxing design that bring personality back into the terminal spaces
- Serves as a gateway to the city by representing the culture of Milan
- Brings back the human scale into the design
- Creates a space that does not cause overstimulation to the users



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Figures

Figure 1,2,3:
(n.d.). From https://vintageairliners.com/cp-air-through-1970s/

Figure 4:
(n.d.). From https://nl.pinterest.com/pin/1042794488714745838/

Figure 5:
(n.d.). From https://stockcake.com/i/busy-airport-terminal_509591_983004

Figure 6:
(n.d.). From https://www.travelandleisure.com/holiday-travel/thanksgiving-travel/thanksgiving-flight-deals-scotts-cheap-flights?utm_source=pinterest.com&utm_medium=social&utm_campaign=social-share-article&utm_content=20211029

Figure 7:
(n.d.). From https://www.vitra.com/en-us/product/airline?subfam.id=36623

Figure 8-17:
own work

Figure 18, 19:
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Figure 20-28:
own work

APPENDIX

06

List of elements that influence the airport service quality

Spatial Layout and Functions:

- clear layout
- airport amenities position
- airport services position
- connection with the parking lot
- presence of baggage cars
- presence of moving walkways and escalators
- queues
- long walking distances
- difficulty with wayfinding
- security process feels intimidating
- duty-free area is overstimulating and unavoidable
- baggage claim services
- difficulty to reach connection flight
- existence of electrical passenger transfer
- existance of comfortable seating for waiting
- open spaces
- many windows to view the planes
- means of optaining information on local attractions and hotels
- poor plan configuration

Ambient conditions:

- loud noises
- bright lights
- crowded spaces
- bilboards, advertisments, screens
- lack of natural light
- soothing music
- air quality
- furniture design

Functions:

- conference rooms
- church
- banking services
- children's play area
- business centers
- relaxing services
- recliner lounges
- national chain restaurants
- baby changing tables
- gym
- educational museums
- mail facilities
- smoking area
- restaurants that serve local food
- retails that portray local culture

Signs & Symbols:

- amount of information constantly delivered
- confusing signs
- difficulty with wayfinding
- not finding out about flight changes
- public announcements
- more flight information displayed
- external signs
- signs through airport directing to airport facilities
- flight information displays are confusing
- excesssive number of signs
- wish for display of art
- airport's decor should match the local culture and history
- modern decor

Service personnel:

- to be neatly dressed
- willing to solve problems
- never to be too busy to respond to questions
- to be able to direct the passenger to the destination
- available to offer individual attention
- easily identified as an employee
- fast respons to any complains
- knowledgeable about local areas of interest

Services:

- clean environment
- quality of basic facilities
- attractivness of space
- use of selfservice technologies
- flight delays
- cancellations
- being search at security creates stress
- can't pick your seat in the plane
- rude behaviour of other passengers
- forced to stay in close proximity to other passengers
- fear of terrorist attacks