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ENHANCEMENT OF TOURISTS' AIRPORT EXPERIENCES USING MULTISENSORIAL DESIGN

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Master's in Tourism Organizations Management

Dissertation made under the Supervision of: Professor Cláudia Margarida Brito Ribeiro de Almeida

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Statement of Originality

Object Detection and Recognition in Complex Scenes

Statement of authorship: With the exception of what is acknowledged in the text, the work described in this dissertation is original to the best of my knowledge and belief. No part or all of the content has been submitted for credit toward a degree at this university or any other.

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Abstract

This dissertation research presents an innovative exploration into how multisensorial design can be utilized to significantly enhance the experience for tourists who pass through any given airport. via a targeted exam of Heathrow Airport, one of the world's most outstanding worldwide travel hubs, the study will inspect the significance of integrating visible, auditory, olfactory, gustatory, and tactile stimuli in creating extra excellent, long-lasting airport reviews.

By highlighting airports' crucial role in influencing travellers' first and enduring perceptions of a place.

While airport infrastructure is a tourist's first and last point of contact during their trip, it is also their primary means of transportation. (Rendeiro Martín-Cejas, 2006).

As one of the leading international gateways, Heathrow offers a perfect environment for researching the possible effects of multisensorial design on visitor experiences.

The overwhelming emphasis on efficiency and practicality in airport design frequently overshadows the value of sensory experiences. This study contends that multisensorial design, involving all senses, may considerably improve the airport atmosphere, increasing travellers' overall pleasure and perception.

The primary goal is to find particular opportunities for implementing multisensorial design at airports to improve the visitor experience. This entails a detailed assessment of the present sensory environment and the creation of tailored design interventions.

The research focuses on using comprehensive surveys to collect quantitative and qualitative statistics concerning travellers' studies at Heathrow Airport, with particular recognition of the impact of multisensorial design elements. The survey design contains questions to assess contemporary delight tiers, sensory perceptions, and emotional responses to the airport environment. contributors can be selected from—numerous pass-sections of Heathrow's international and home travellers to ensure a broad representation of reviews and perceptions.

It expects multisensorial design components to improve emotional well-being, boost visitor satisfaction, and provide a more engaging and memorable airport experience. It attempts to create a framework for incorporating sensory design in airports, transforming how airport environments are designed and evolved. Focusing on Heathrow Airport offers crucial insights into how multisensorial design might be used to boost visitor experiences at airports. It contributes to fields such as psychology, design, and tourist management by providing a fresh perspective to airport design promoting human sensory experiences.

Keywords: Tourism, Multisensorial design, Heathrow Airport, Tourist experience, Visitor satisfaction, Memorable airport experience, Tourism management.

Resumo Alargardo

A presente dissertação apresenta uma análise exploratória inovadora por via da utilização de uma conceção multissensorial que pretende melhorar significativamente a experiência dos turistas que passam por qualquer aeroporto. Tendo como objeto de estudo o Aeroporto de Heathrow, um dos maiores hubs internacionais, este estudo pretende avaliar os aspetos sensoriais associados aos cinco sentidos enquanto elementos que impulsionam uma experiência diferenciadora e até mesmo de maior ligação entre o passageiro e o próprio aeroporto.

Pretende-se evidenciar o papel que os aeroportos desempenham enquanto influenciadores de criação de uma perceção de um local, de um destino e até mesmo de um país.

Embora as infraestruturas aeroportuárias sirvam tanto como o primeiro e último ponto de contacto de turista durante a viagem, serve também como o seu principal meio de transporte (Rendeiro Martín-Cejas, 2006).

Como um dos principais hubs internacionais, o aeroporto de Heathrow oferece um ambiente perfeito para pesquisar os possíveis efeitos de conceção multissensorial nas experiências dos passageiros.

A grande ênfase que se coloca na eficiência e no design de um aeroporto normalmente acaba por retirar importância às questões sensoriais. Por este motivo, este estudo visa abordar o design multissensorial, envolvendo os cinco sentidos, com vista a melhorar a qualidade da atmosfera do aeroporto, e por consequência a experiência do passageiro.

Deste modo este estudo tem como objetivo principal encontrar oportunidades de implementação de conceção multissensorial nos aeroportos para melhorar a experiência dos visitantes. Tal implica uma avaliação pormenorizada do atual ambiente sensorial e da criação de medidas que sejam adequadas. Este estudo apresenta uma metodologia baseada numa recolha de dados quantitativos e qualitativos que visam conhecer a opinião dos passageiros no Aeroporto de Heathrow, principalmente no que se refere ao impacto de elementos de design sensorial. Deste modo foram aplicados questiona´rios com diversas questões que nos permitiram conhecer as opiniões dos passageiros tanto ao nível das questões sensoriais como também de questões emocionais

relacionadas com o ambiente e atmosfera do aeroporto. O questionário foi aplicado a passageiros internacionais e nacionais por forma a recolher uma amostra representativa.

Espera-se com este estudo que a inclusão de componentes de design multissensorial melhore o bem-estar emocional, aumente a satisfação dos visitantes e proporcione uma experiência aeroportuária mais envolvente e memorável. O objetivo é criar uma estrutura para incorporar o design sensorial nos aeroportos, contribuindo assim para uma transformação na forma como os ambientes aeroportuários são concebidos e evoluídos. Focar no Aeroporto de Heathrow oferece insights cruciais sobre como o design multissensorial pode ser utilizado para melhorar as experiências dos visitantes nos aeroportos. Este enfoque contribui para diferentes áreas, como psicologia, design e gestão turística, ao proporcionar uma nova perspetiva ao design aeroportuário que promove experiências sensoriais humanas.

Palavras-chave: turismo, design multissensorial, aeroporto de Heathrow, experiência turística, satisfação de visitantes, experiência de visitantes, experiência memorável, gestão do turismo.

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ANOVA	Analysis of Variance
ASQ	Airport Service Quality
ACI	Airports Council International
CUSS	Common Use Passenger Self Service
UK	United Kingdom
BCG	The Boston Consulting Group
IATA	International Air Transport Association
ADHD	Attention-Deficit/Hyperactivity Disorder
CEO	Chief Executive Officer
MSD	Multi-sensory design
OECD	Organisation for Economic Co-operation and Development
SITA	Société Internationale de Télécommunications Aéronautiques.

CHAPTER ONE

1. Introduction

1.1. Background of the Study

Airports are highly stressful environments. Many challenges may develop in an airport setting, including passengers experiencing delays due to traffic, lengthy check-in processes, late flights, and rigorous security inspections.

Nevertheless, it is of the utmost importance to understand that an airport performs a purpose beyond enabling passenger transit; it is also an intricate web of logistics and operations. It may also be perceived as representing its city or country and will help shape passengers' opinions about the destination. According to Ali, Kim, & Ryu (2016), an amalgamation of unique elements of national identity in designing services in international airports can provide passengers and visitors with a distinctive cultural experience. It can significantly influence the image visitors have of a nation.

Consider how an attraction is regarded to ensure that tourism there is successful. Even though every customer relies on their senses to guide them when making choices, they have typically been ignored. By using sensory stimuli to make the experience more unique, businesses may help their clients develop a connection with their products or services.

It has been suggested that we live in an 'experience economy', in which many consumers value the experiences offered by brands, in some cases seemingly over the utility of the goods or services themselves (Pine & Gilmore, 1998). Moving ahead of conventional marketing standards that prioritise sight and sound alone creates long-lasting memories and emotional connections with customers.

Multisensorial design components refer to various components that create stimuli using our five basic senses. The input and sensation you get when one or more of your senses are stimulated is known as sensory stimulation. The five senses are critical in how a person experiences various purchasing and consumption activities. A person's experiences with various purchases, frequency of purchases, and consumption process all heavily rely on their five senses. A consumer can distinguish between one brand and similar brands using their senses (Nandagopal, 2015).

This study will be primarily looking into how the senses which are; sight, hearing, touch, and smell are stimulated in airport spaces. There are a few airports that have multisensory design aspects that enhance the overall experience for travelers. Singapore's Changi Airport has a beautiful mobile raindrop sculpture that doubles as an art piece. At San Francisco International Airport, interactive areas are constructed like museum exhibits. The Dallas/Fort Worth International Airport also has an entertainment area with an aviation theme that is especially designed to entertain and engage younger tourists.

1.2. Statement of the Problem

Travelling by air is fast and practical. It has also been made easy for travelers to connect to various destinations, which continues to guarantee its importance as the core element of tourism.

Air transport is an indispensable tourism element, providing the fastest link between the tourist population and their destinations. More than 70% of international tourists travel by air (Air Transport Action Group, 2017).

Tourism can be perceived as an escape or change from daily realities. However, tourists may occasionally feel detached from and disappointed with how locations are presented. That is why today, a growing percentage of tourists seek connections to the sites or destinations they wish to visit.

Like other institutions, airports are starting to recognize the significance of offering exceptional client experiences due to the growing trend of experiencing tourism. They may enhance their customers' experiences by utilizing multisensorial designs.

Incorporating multisensory design that the senses have been shown to improve user experiences in various sectors, including retail and hospitality.

There has not been much research on the impacts multisensorial design has had on enhancing airport experiences.

This dissertation aims to fill those research gaps by systematically analyzing how multisensory design can improve airport tourist experiences. The research will provide useful direction for future airport design and policymaking, making airports hospitable and pleasurable settings that enhance a tourist's entire travel experience.

Multisensory design is a valuable instrument in the tourism sector. It improves the quality of visitor encounters, fosters happy memories, and can even influence destination and service selection. By deliberately combining sensory aspects, tourism companies may create more engaging, fulfilling, and accessible experiences for guests.

1.3. Objective of the Study

This study tries to show how vital multisensory stimuli are for improving airport tourism experiences. Heathrow Airport in the UK will be the case study that this paper focuses on. The study intends to accomplish the following particular goals:

1.1.1 To highlight the significance and impact of multisensory stimuli on tourism in airports.

1.1.2 To investigate the overall impact of multisensorial design on improving airport experiences

1.1.3 To explore the most efficient multisensorial design components to be applied in airports for maximum passenger satisfaction.

1.4. Approach and Significance of the Study

The research delves into the intricate correlation between human reactions and sensory inputs in the high-stress setting of airports, utilizing ideas from design studies, environmental psychology, and tourism management.

This study draws on various hypotheses about how airport environments engage the five senses and impact passengers' perceptions, stress levels, and general pleasure. Using well-crafted surveys, the initiative collects data from a sizable portion of Heathrow Airport users. Thanks to these measurable facts, a thorough analysis of the proposed ideas and a trustworthy estimation of the impact of multimodal design on the airport experience will be possible.

The project aims to provide clear, statistically backed insights into how multisensorial settings could be improved to increase visitor happiness, with an emphasis on employing quantitative methodologies. The findings should aid legislators, designers, and airport authorities in making informed decisions about adding sensory elements that enhance passengers' overall airport experiences.

This demonstrates why airport environments must be designed to meet both the practical and psychological needs of travellers. This thesis highlights the value of using multisensorial

design as a tactical tool in the cutthroat industry of international airports in order to draw and keep visitors with an exceptional design. It does this by providing some numerical evidence of the advantages this design strategy offers.

1.5. Organization of the Study

The introduction, methodology, data analysis, discussion, results and suggestions, references, and appendices make up the dissertation's seven main chapters.

It starts with a summary that builds the context for the research by highlighting its aims and significance. Following that, a thorough literature analysis examines previous studies on multisensorial design and its influence on human behaviour and space perception, notably at airports.

The primary focus of the dissertation is a comprehensive methodology section describing a quantitative strategy for evaluating the impact of multisensorial components on a passenger's experience and satisfaction. This includes an explanation of data collecting and analysis techniques. The findings from the research are then discussed, providing information on how the five senses affect travelers' emotions and perceptions in airport environments.

Following an extensive examination of the findings' implications for airport design and administration, a discussion section puts these findings into the larger context of the body of current literature. A synopsis of the main results and useful recommendations for using multisensorial design techniques at airports are provided in the final section of the dissertation. In addition, it suggests potential avenues of investigation for related future studies. The research's appendices provide an extensive compilation of references as well as supporting resources such as data tables, survey instruments, and in-depth methodological feedback. This structure ensures a coherent and systematic presentation of the research, incorporating the theoretical basis and practical implementations, underlining the importance of multisensorial design in enriching passenger experiences at airports

CHAPTER TWO

2. Literature Review

2.1. What is Multisensory design?

Multisensory design is described as an innovative approach to environmental design that integrates multiple human senses into experiences that are immersive, engaging and reminiscent of this design's visual philosophy, auditory and olfactory, to positively influence perception, behaviour and emotion. It emphasizes that flavors and combinations are delivered to the spatial environment

Multi-sensory design (MSD) focuses on user's sensory perception. The experience of product, service, or a system resonates from the personal multi-sensory response (Dal Palù et al., 2018) and designers who are designing an intentional experience are more likely to succeed when being aware of the transferred message on every sensory channel (Schifferstein, 2011)

The strategic application of sensory inputs to improve travellers' overall experience is known as a multisensorial design in the setting of airports. Included in this is the use of aesthetically pleasing designs, soothing audio scapes inspired by nature, aromatherapy to arouse good feelings or memories, food options that highlight regional cuisines, and tactile elements that imply comfort and quality. To make the airport a memorable, cosy, and interesting aspect of the travel experience instead of just a merely utilitarian area is the aim.

Airports may greatly enhance the quality of the visitor experience by implementing a multisensorial approach, which has a likelihood of making transit and waiting periods less stressful. Increased passenger happiness and retention, as well as a favourable impression of the airport's brand, are possible outcomes of this strategy.

The design aimed at enhancing people's pleasure and feelings must incorporate sensory experiences (Schifferstein, 2011)

Through sensory design, the human body's intuition, touch, sound, smell, sight, and taste are engaged. Irrespective of our sensory capacities, everyone has a chance to learn, explore the world, feel excitement and wonder, and experience social relationships because of sensory design.

2.1.1. The Five Senses

Sight: Sight is essential to design and is arguably the most pervasive sense in human perception. Visual components in multisensory design include colour schemes, lighting, signage, and aesthetic aspects in the physical arrangement of the space.

Vision, which is a sense that shapes the consumer's perception of a brand and forces him to interpret simply by seeing the product, rather than feeling it, is one of the most important senses that leads people to experience the goods and services that surround them, according to Hultén (2013).

Large windows that let in plenty of natural light, dynamic digital displays, art installations, and well-thought-out navigation systems are examples of visually pleasant features found in airports. An atmosphere (such as one that is peaceful or energizing), effective passenger guidance, and the provision of crucial information may all be achieved with the use of visual design.

Sound: Sound encompasses both the ambient noises in an environment and intentional auditory inputs like music or announcements. Good acoustic design can significantly impact a person's experience in a space.

Sound can be employed in a variety of ways to give each person different sensory experiences, such as the sound expression of a jingle, speech, or even music, which can produce a very rich listening experience. So, deliberate use of sound can enhance a company's success and differentiation and, as a result, define its brand (Pawaskar & Goel, 2014).

In airports, managing sound involves minimizing unpleasant noise (like loud announcements or the hum of machinery) and potentially incorporating soothing music or nature sounds in lounges or waiting areas. Acoustic planning also involves controlling echoes and ensuring clear communication through public address systems.

Taste: Taste is a sense that is directly experienced via eating and drinking. It may have a big role in the experience design, particularly in settings where dining is an element.

The palate is a sense of the human body that is essential to the sensory experience of the consumer. In order to build a stronger brand and grow the concept of emotion, brands should make use of

this. Also, businesses should focus more on building relationships with their customers rather than just sticking to their comfort zones (Airikka, 2014).

This might entail providing a range of dietary alternatives in airports to suit different palates, including cuisine from the region to introduce travellers to the local way of life. Specialty and gourmet meals may also improve the overall travel experience, especially with transit passengers who might not want to exit the airport.

Feel: Anything that can be felt or handled with the human hand is regarded as tactile design, including materials, ergonomics, temperatures, and textures. Convenience quality, and stability may all be expressed through touch.

As they employ marketing that is based on actual experiences, brands that choose **tactile** interactions can improve customer and market recognition of their brand. (Pawaskar and Goel, 2014).

Tactile delights in an airport might include cozy chairs, the feel of materials in the lounges, the quality craftsmanship of the doorknobs, railings, and even the carpeting under your feet. In sitting segments, check-in counters, and other touchpoints, ergonomics are important.

Smell: It is a strong sense that is tightly linked with memories and emotions. Managing and introducing specific smells into a space is referred to as "olfactory design".

Pawaskar and Goel's (2014) research, supports the idea that brand image benefits from the development of **olfactory** sensory experiences by stating that smell is a crucial sense for communication between a person and a product. However, because each person has a unique set of memories and evaluations of the olfactory experience, the sense of smell can also be a hindrance in some sensory encounters.

Scent: Airports may use scent to create a relaxing and pleasant ambience. This might be achieved by the inviting odours of dining establishments, the naturally occurring perfume of indoor plants, or carefully chosen fragrances in lounges or shopping areas. Maintaining an agreeable atmosphere also requires controlling unpleasant smells.

2.2. Understanding Passengers' Airport Experience

In tourism, the journey starts well before the actual trip. Airports, as the first and last point of contact for travellers, have grown to become more than just international gateways to destinations. There has been a movement in airport design literature toward an emphasis on passenger comfort and satisfaction. These transportation nodes are essential in determining whether a visitor has a good or stressful stay in the area. Thus, they must be well-designed and well-run.

The significance of passenger experience in airports goes well beyond simple transportation; it includes a thorough strategy to guarantee passengers' comfort, contentment, and productivity. This focus has significance for several different reasons:

Travellers frequently form their first and final impressions of a place at airports. A good airport experience may make a big difference in how visitors see their trip overall, whilst a bad one can ruin it.

Increased global mobility has sparked a renewed focus on how airports may better meet the requirements and preferences of their customers. In this environment, multimodal design to improve travellers' experiences in airports is a promising new frontier. Multisensory design is a strategy used to create environments that engage all of a visitor's senses, which is especially useful for creating memorable experiences for tourists.

In this literature review, we'll look at how we now understand airport experiences, the effect multisensory design has, and the possibilities for how it may improve airports as tourist destinations.

Airports are an essential part of the air transport system and an important mode of transfer for air travel; airports enable air travellers to switch from the ground to the air and vice versa (Ashford, Stanton, & Moore, 2006). Several studies highlight the importance of positive airport experiences. Most notable is the work of Neufeld (2018), which highlights that passenger satisfaction with airport experiences directly influences their overall travel satisfaction. Research also underscores the necessity of efficient, comfortable, and engaging environments within the airport (Graham, 2014; Rhoades & Waguespack, 2005).

Airports compete not just with airlines and routes but also with the standard of experiences and services they supply, especially when travellers have alternatives. Better passenger experiences at airports are far more likely to attract interest in airlines, boost traffic, and win over passengers.

Airports are important economic drivers for the communities they serve. A satisfying traveller experience may boost internal spending on food, shopping, and services at the airport, boosting income both there and in the community.

The 'airport experience' concept is multidimensional and moves beyond the basics of infrastructural design and functionality. It includes airport ambience, service quality, facilities, shopping and dining options, security procedures, signage, and passenger flow management (Graham, 2014). However, the predominant focus has been on efficiency and functionality, often at the expense of passengers' emotional well-being and overall experience (Rhoades & Waguespack, 2005).

Passengers may experience severe stress when travelling, especially while passing through airports. Improving the passenger experience through smooth processes, cosy environments, and engaging activities can minimize stress and enhance the whole travel experience.

Increasing the effectiveness of operations alongside improving the passenger experience often go hand in hand. For instance, more efficient security and check-in procedures enhance not just the traveller experience but also the airport's capacity and throughput.

Emphasizing passenger experience involves making airports accessible and inclusive to all travellers, including those with impairments, families with children, and older individuals. This inclusion is vital for offering equal access and opportunity to all tourists.

In recent years, airports have begun to accept their role as providers of experiences. Recognising that passengers, mainly tourists, demand more than efficient services, airports increasingly focus on providing enjoyable experiences (Bieger, Wittmer, & Laesser, 2007). They are changing into 'airport cities,' incorporating amenities including food, retail, entertainment, and relaxing areas.

In spite of these changes, many travellers are left feeling unhappy with their airport experience. Stressful security procedures, long queues, crowded waiting areas, poor wayfinding, and lack of

comfortable resting areas are common issues identified by passengers (Kazda & Caves, 2015). For tourists, these bad experiences may set a negative tone for their entire trip.

Passenger experience-focused airports are more likely to be positively viewed, which improves their brand image. Due to their favourable impression, passengers are more inclined to select routes that pass via these airports, which can boost passenger loyalty.

Airports are encouraged to continually collect data and make improvements when they pay attention to their consumers' experience. As a result of this continuous development process, new designs, services, and innovations that further improve passenger experiences may be incorporated.

Airports that apply worldwide best practices and guidelines regarding passenger experience can distinguish themselves in global travel. Apart from raising service levels, this commitment to excellence establishes the airport as a pioneer in the global aviation market.

Research on improving airport experiences has explored various aspects, such as service quality improvement, technology adoption, and space utilization (Neufeld, 2018).

Passenger experience-focused airports are better equipped to adjust to events such as medical emergencies, natural disasters, and shifts in travel trends. Their attention to passenger welfare makes them more flexible and adaptable to changing requirements.

However, these studies often ignore the potential of engaging passengers' senses to enhance their airport experiences. In the next section of this review, we will discuss the manner in which multisensorial design fundamentals in order to improve the experience of tourists at airports. These concepts have been verified as effective in numerous other sectors, and we can utilize them to make airports better places for travellers.

2.3. Factors Influencing Passenger Experience in Airports

A multitude of intricate aspects interact to define the overall comfort, convenience, and pleasure of travellers, which in turn shapes the passenger experience in airports. Efficient check-in and security procedures are critical because they create a pleasant impression for the traveller, whereas lengthy and drawn-out processes might aggravate them. The airport's efforts to maintain health

and safety are reflected in the establishments' cleanliness and sanitation, which is a becoming more essential aspect.

Security control, deficient signalling, and long queues are the main sources of dissatisfaction. Once in the airport terminal, a significant part of traveller satisfaction derives from the process and discretionary activities (Popovic et al., 2009).

Clear and simple directions reduce travel anxiety. Wayfinding and signage are essential for navigating the frequently expansive airport areas. The state and accessibility of amenities consisting of spaces for relaxing, outlets for charging, and restrooms directly affect passengers' comfort and convenience, which in turn affects how long they spend in the airport. Furthermore, the variety of shopping and food alternatives may make waiting periods pleasurable by providing entertainment and relaxation.

One particularly essential element is customer service, wherein the attitude and effectiveness of airport staff have a major impact on how situations relating to travel are handled and how satisfied customers are in general. Physical surroundings such as seating layouts, areas for relaxation, and the overall mood created by the choice of aesthetics and architectural design each significantly influence the passenger experience.

Modern, connected travellers anticipate technological facilities like free Wi-Fi and digital services for flight information and airport guidance. Additionally, multisensorial experiences like relaxing music, natural lighting, and nice fragrances may significantly improve the atmosphere, turning the airport into a place of rest rather than tension.

Thanks to accessibility and inclusion, all travellers may easily explore and enjoy the airport regardless of their physical requirements or abilities. Parking facilities and the effectiveness of transportation linkages to and from the airport facilitate a smooth travel experience. While health and safety precautions, particularly in light of current global health concerns, are crucial for fostering trust in the travel process, efficient luggage management that minimizes delays and losses reassures travellers.

Cutting-edge queue organizing techniques that cut wait times at many points of contact improve both the operational effectiveness and satisfaction of the airport experience. When combined, these

elements define the complicated landscape of the airport passenger experience, stressing the importance of using a comprehensive and creative system for airport design and administration.

2.3.1. Physical Environment

The physical environment is offered as a complete and integrated area that profoundly affects tourists' sensory experiences. This encompasses the intentional layout and orchestration of architectural elements, spatial layouts, and ambient functions that collectively stimulate the senses sight, sound, scent, contact, and flavor to create an immersive and high-quality airport experience. The layout principles extend beyond mere capability, aiming to rouse feelings, reduce stress, and reinforce the general perception of the airport as a welcoming, cosy, and attractive area.

The dissertation investigates how airport design serves operational demands and sets the setting for a trip that may be as rewarding as the destination itself. Airports can be transformed into serene and exciting locations with proper planning, where natural and artificial lighting interact to enlighten and warm the interiors, making huge expanses feel small and manageable. Temperature and air quality are rigorously maintained to provide comfort, reflecting a knowledge of its passengers' different origins and destinations.

Cleanliness and maintenance are highlighted as silent yet powerful contributors to a positive environment, signaling care and respect for the visitor's experience. The ambient noise, often overlooked, is strategically managed through design and technology to minimize stress-inducing sounds while possibly introducing harmonious elements that contribute to a sense of place or calm.

Natural elements, such as plants and water features, are used to give a sensory break from the mechanical and computerized, grounding visitors in a more organic environment. Seating and rest places are intelligently built and situated, providing respites for relaxation and introspection amidst the rush and bustle of travel.

Cultural elements, such as artefacts, paintings, or unique interior design, entice travellers to take pictures, upload them, and share them on social media to represent their roles as tourists before leaving the destination (Neuhofer et al., 2013).

Moreover, the dissertation explores how facilities, from restrooms to dining and retail options, are not just facilities but experiences in themselves, contributing to the airport's sensory tapestry.

Signage and wayfinding are addressed as more than informational gear; they are part of the visible and cognitive environment that guides and reassures vacationers through their journey.

Accessibility and inclusion are underlying themes, ensuring that the physical environment accommodates all users and allows for a smooth experience that values variety and supports equality. The dissertation contends that by adopting a multisensorial design approach, airports may transcend their conventional responsibilities, becoming sites of joy and discovery that improve the visitor experience even before the journey begins.

2.3.2. Service Quality

Service quality is conceptualized as a quintessential component of the overall airport experience, deeply intertwined with the physical and sensory environment to create a holistic impact on travellers. This technique to service excellence transcends traditional metrics of efficiency and reliability, embedding itself within the nuances of human interplay, the ambient atmosphere, and the supply of offerings that cater to a big selection of wishes and preferences.

Airports attempt to ensure acceptable service levels by implementing service quality guidelines and criteria specifically framed for airport functions and operations, which are addressed in research and international ranking (Correia et al., 2008)

As this study explores, service quality is about creating moments of joy, comfort, and ease that resonate with people personally, not just about analysing data rapidly or conducting operations related to logistics smoothly. It considers every point of interaction a visitor has, from digital displays and information desks to direct conversations with friendly airport employees who uphold the spirit of friendliness and support. A worldwide traveller base with a variety of experiences, cultures, and languages is acknowledged by these service aspects, which are made to be easy to use, responsive, and receptive.

Recent criticisms have highlighted flaws in the service quality technique, such as its failure to provide an accurate understanding of traveller experiences and how to considerably enhance them having positive perceptions of airports. Critics believe that service quality focuses too much on specific processes and amenities rather than capturing the entire experience. It falls short of giving a comprehensive picture of what travellers genuinely perceive and encounter during their airport journey, implying the need for a more holistic knowledge of passenger experiences.

Rather than distinct, independent operations, customers explore an airport and enjoy a range of activities and services as a continuous journey. More recent studies have shown that passengers want to have a smooth and seamless journey (DKMA, 2014; BCG, 2016; OECD, 2016; SITA, 2016).

Airports are now viewing the passenger trip from a different angle, highlighting the need for a more comprehensive and immersive strategy as a result of this awareness. As a result, the idea of the passenger airport experience has surfaced as a complete framework designed to increase passenger happiness by examining the airport journey from a more holistic perspective.

Through the lens of multisensorial design, the dissertation explores how service quality is perceived and how even the smallest interactions or environmental signals may have a big influence on a traveller's mood and delight. By using visual, textual, and maybe even auditory indicators to boost spatial perception and lessen cognitive stress, the wayfinding system, for instance, is designed to be aesthetically pleasing and effortlessly accessible in addition to being effective.

Moreover, the inclusion of multisensorial elements such as ambient scents, tactile materials, and carefully curated sounds within service areas is examined for their ability to evoke a sense of place, comfort, or brand identity, contributing to a richer, more memorable airport experience. These sensory dimensions of service are seen as pivotal in transforming mundane or stressful aspects of travel into enjoyable and comforting experiences.

The standard of services is also maintained in digital spaces, as travellers may benefit from personalized experiences, instantaneous updates, and easy navigation via airport services on mobile and web platforms. This provides passengers with a greater sense of productivity and autonomy. Accessibility and inclusiveness are also essential to ensure that every person, regardless of expectations or challenges, receives excellent levels of service. This helps to create a friendly and accommodating airport environment for all.

Airports generally value face-to-face customer service because numerous airport managers believe that a personal encounter fosters improved relationships with customers (Bitner, Booms, & Tetreault, 1990; Pugh, 2001) and enhances the quality of interaction.

One striking example of how airports may improve the travel experience in a comprehensive and subtle way is Heathrow Airport's adoption of multisensorial design concepts. Heathrow has not only raised passenger pleasure but also raised the bar for airports throughout the globe by carefully incorporating sensory components into the surroundings. This case study demonstrates how multisensorial design has the power to radically alter environments in ways that greatly connect with people, providing insightful information for upcoming aviation-related initiatives and beyond.

2.3.3. Technology Integration

Technology integration is envisioned as an essential strategy for improving tourists' sensory experiences within the airport. This method uses the latest innovations in technology not just as efficiency and convenience aids, but also as vital aspects that enrich the airport's multisensory environment, resulting in a smooth, immersive, and customized experience for travellers.

The subject matter delves into how technology might be incorporated into the very essence of the airport's architecture and operations to awaken the senses and elicit good feelings. All airport operators need smart airport management solutions to expedite airport ground handling and passenger processing effectively without delays and long queues (Jaffer & Timbrell, 2014). From interactive digital signage that responds to a traveller's presence, delivering customized welcomes and directions, to immersive installations that employ music, light, and pictures to transport visitors to new landscapes or experiences, technology serves as a conduit for sensory engagement.

Technology can also enhance the more subdued elements of the airport experience to create a multisensorial design. Ambient intelligence systems modify lighting and temperature in real time based on population density or time of day to subtly improve comfort levels without requiring overt human interaction. The deliberate use of scent dispersal technology creates a serene, revitalizing, or even themed ambiance that adds to the airport's distinct sensory character.

The dissertation also explores how wearable technologies and smartphone applications provide customized experiences that give passengers autonomy over their travels. By combining ease and a dash of personalised attention, these services may prescribe tailored routes through the airport, notify users of changes to their flight status, or even advise restaurants based on individual interests.

For example, a passenger is unlikely to go to an airport with a desire to check-in. The use of CUSS kiosks is then introduced to offer value, which is to eliminate the burden caused by the check-in process (e.g., long queues, bad service encounters) and allow passengers to have control over their transactions, save time, and enhance self-efficacy (Meuter et al., 2003).

By employing technology in the multisensorial design of an airport, the objective is to create an engaging and unforgettable experience that uses digital technology to improve both physical and sensory dimensions. This incorporation comprehends that modern passengers have evolving standards. They want to be involved in a setting that stimulates their senses, provides comfort, and occasionally even surprises them with pleasant experiences rather than just travelling through locations.

2.4. Case Study

2.4.1. Multisensorial Design at Heathrow Airport

Heathrow Airport is one of the world's largest and busiest international airports in London, UK. It is a primary hub for worldwide tourists, connecting to over eighty destinations throughout ninety nations. With its substantial passenger volume, Heathrow presents an excellent case study for examining the application and impact of multisensorial design in enhancing the airport experience.

Heathrow has long understood how important a positive traveller experience is in sustaining its position as one of the globe's top transportation hubs. In response to evolving visitor expectations and an increasingly competitive international airport scene, Heathrow Airport has initiated a multisensory design element implementation endeavour across its terminals. By establishing a peaceful and engaging environment, this strategy hopes to improve the entire experience for travellers, staff, and guests.

The airport creates a visually appealing atmosphere by utilising natural lighting, spacious structures, and art installations. Massive windows and an arching ceiling enhance natural light at Terminal 2, popularly identified as The Queen's Terminal, making it an attractive location for people looking for outdoor lighting during the daytime.

The Royal Aeronautical Society details some influential art pieces in the airport. The first is a massive 77-ton, 78-meter-long, twisting aluminium sculpture, Slipstream, located in the entry court of the recently constructed Terminal 2 at London Heathrow Airport. Richard Wilson RA made the sculpture, and the hypothetical flight path of a little stunt plane inspired its form.

Second, is the orange neon London taxi cab framework at the Heathrow T2 departure hall. The plinth, designed by Benedict Radcliffe, has an etching that provides a detailed route from the artist's Shoreditch workshop to Terminal 2.

Heathrow takes a certain approach to reducing and controlling noise levels and fostering a more peaceful environment. The worry-inducing loudness frequently associated with crowded airport surroundings is lessened in some sections by the thoughtful installation of sound-absorbing materials and soft background music.

The airport strives to decrease its noise levels, recognising that it is a serious problem for nearby residents. Its 2024-2028 Noise Action Plan seeks to minimise airport noise.

Holland (2019), in his article, discusses Heathrow's Sound Escapes, created in partnership with sound artist Nick Ryan, which includes over 30 sounds recorded in 13 different locales. It is based on more than 24 hours of audio submissions by travellers sharing vacation sounds. The Heathrow Airport Chief Commercial Officer Ross Baker was quoted as having said, "Sound Escapes embodies the thrill, joy, and adventure of going on vacation. We hope this music delves into travellers' memories to provide an auditory experience stimulating their next voyage."

Adding soft, pleasant smells to strategic locations creates a welcoming and calm atmosphere. These aromas are thoughtfully chosen to accommodate various sensitivities and tastes while avoiding overbearing scents.

Heathrow offers pleasant and soothing tactile experiences while ensuring careful consideration of materials and textures. Tactile factors greatly influence travellers' physical comfort, from the spotless, smooth surfaces of check-in counters to the cosy chairs in waiting rooms.

They aim to provide a diverse culinary experience, which is evident in the range of dining alternatives. An emphasis on quality and diversity, ranging from quick snacks to sumptuous feasts, satisfy a global audience's tastes.

To reduce tourist discomfort and streamline the travel process, the airport uses a wide range of the latest technology, including CUSS, interactive navigation, and automatic biometric boarding. While digital signage informs travellers with real-time information, augmented reality applications and sophisticated security scanning technology increase engagement and efficiency.

Environmental surveillance systems ensure the surrounding area is cosy by monitoring the temperature, lighting, and air quality to optimal levels. In addition, airport operations are designed to reduce the disruptions of nearby residents and passengers by using noise control systems. Altogether, these digital updates at Heathrow support the airport's broader goal of developing a sensory-rich environment that predicts and caters to the varied requirements of its international patrons while also making travel easier and more pleasurable.

The use of multisensorial design at Heathrow Airport has significantly increased passenger contentment, as proven by customer feedback and industry awards. Passengers have reported feeling calmer and less anxious throughout their visit to Heathrow, demonstrating the positive impact of the sensorial design elements. Furthermore, Heathrow has received various prizes for its commitment to enhancing passenger experience, demonstrating the effectiveness of its multisensorial design philosophy.

Overall passenger satisfaction is now at or above pre-pandemic levels. In January, 98% of passengers waited less than 10 minutes for security, and Heathrow has again been named Travel Weekly’s Best UK Airport (Heathrow, 2023). The article also quoted Heathrow's former CEO, John Holland-Kaye, who said, “Heathrow is back to its best, with passenger satisfaction scores meeting or exceeding 2019 levels. We warmly welcome families over the half-term getaway by delivering excellent service and bringing back the magic of travel.”

2.4.2. Sensory Rooms

Hidden disabilities are those that are not immediately noticeable due to a not physical nature and are usually chronic illnesses.

Their non-physical character contributes to a rise in acknowledged hidden impairments, which causes underdiagnosis and ignorance. As knowledge grows, people identify with these disorders more often, emphasizing the need for more assistance and awareness of the difficulties related to invisible impairments.

The most pronounced change is the upward trend in reported mental health impairments, which increased by 13 percentage points over these eight years. Social or behavioural impairments also rose by three percentage points, with 9% of disabled people reporting these in 2019/20, before a one percentage point decline in 2020/21. (Esme Kirk-Wade, 2022)

Heathrow Airport has taken inclusion and passenger comfort the extra mile by establishing multisensory rooms where sound and lights activate with the simple switch of a button. For tourists with hidden impairments which may include anxiety, autism, Attention-Deficit/Hyperactivity Disorder (ADHD) and other cognitive, neurological or neurodevelopmental disabilities, experiences at airports may be too draining. These rooms are supposed to offer them a comforting atmosphere. A haven from the chaos of the airport, sensory rooms have amenities like cosy seats, gentle lighting, and stimulating sensory activities that help to lessen tension and overstimulation. The experience is customized to each passenger as they can easily transform the room from calm, relaxing surroundings to an interactive, fun environment filled with colourful lights and stimulating sounds.

The airport also provides free colourful sunflower lanyards and sensory object packs to enable individuals with hidden abilities to communicate with the airport staff. The kits contain a fidget toy, a key ring, and mobility and emotions cards. Heathrow's integration of various places not only respects its visitors' different demands but also improves the airport experience for those who want a peaceful and restful environment before their trip. This program underscores Heathrow's dedication to increasing accessibility and providing a great trip for all passengers, demonstrating a deliberate approach to passenger well-being and inclusion.

2.5. Benefits and Challenges of Multisensorial Design in Airports

The study of multisensory design at airports illustrates a variety of benefits and obstacles. This technique, which utilizes several senses to create a unified and immersive environment, has tremendous potential to upgrade a traveller's airport experience. However, executing such design ideas is not without challenges**.**

Since multisensorial design concentrates on the human experience in a setting that is frequently related to anxiety and unease, it has numerous advantageous implications. Airports may be changed into cozy, pleasant, and even exciting spaces by carefully combining visual, auditory, olfactory, tactile, and gustatory aspects.

Airports adopt arts and artefacts together with the use of senses (sensescapes), such as smell and sound, to enhance pleasure, alleviate the anxiety of travellers, and increase the aesthetic appreciation of passengers of airport terminals (Prazeres & Donohoe, 2014)

By using all of the senses, passengers may substantially reduce any stress and discomfort they usually encounter, which aids navigation and feels like a shorter waiting time.

Beyond human well-being, multisensorial design may improve how airports are perceived, converting them into attractions rather than simple transit hubs. This strategy not only raises consumer satisfaction, but it may also provide economic advantages by promoting spending inside airport amenities, increasing brand loyalty, and attracting more travellers through favourable word-of-mouth.

However, several challenges emerge while employing multisensorial designs in airports. One of the major difficulties involves creating designs for a diverse global clientele. Sensory-based perceptions and aesthetic preferences tend to vary drastically among different cultures, making it harder to achieve a universally appealing atmosphere. In addition, the scope and intricate nature of airport operations makes it laborious to incorporate and manage multisensorial elements while protecting functional efficacy.

Cost is also an important concern since developing and maintaining advanced design aspects might need significant cost. Furthermore, quantifying the success of multisensorial design interventions

presents unique problems, necessitating extensive and continuing assessment to verify that the desired advantages are realized.

Furthermore, it is difficult to balance sensory stimulation without overloading passengers. Too much stimulation may be as damaging to the passenger experience as inadequate stimulation, creating a need for an appropriate balance that optimizes rather than detracts from satisfaction and comfort. There is also a necessity for inclusion, and this means ensuring that design operations accommodate all consumers including those with particular sensory needs or impairments, which necessitates careful planning and design flexibility.

Notwithstanding these difficulties, multisensorial design has the unquestionable ability to completely transform the traveller experience at airports. Airports can leverage the whole range of sensory design to create more engaging, pleasant, and memorable experiences for travellers by tackling these challenges via creative design solutions, cooperative planning, and adaptive management. The dissertation's examination of these advantages and difficulties attempts to advance the discipline by providing a framework for the application of multisensorial design at airports and other settings in the future.

2.6. The Impacts of Multisensory Design

Research suggests that integrating multisensory design, which engages multiple senses, may improve experiences across various industries. Hultén (2011) explains that engaging customers' senses can lead to more immersive experiences and deeper emotional connections. Retail settings have applied this strategy extensively, with Spence, Puccinelli, Grewal, & and Roggeveen (2014) demonstrating that multisensory retail environments increase customer satisfaction, spending, and return visits. Various studies have empirically demonstrated that physical environments can elicit positive emotions and satisfaction in customers (Bitner, 1992, Ladhari, 2009).

The airport industry is an organization that offers more than just flight sales but also other products and services. The air transport business has become a huge enterprise, and airports have started to offer various retail, shopping, and entertainment services like duty-free shops, retailers, restaurants, cafes, and even hotels (Han, Kim, & Hyun, 2014).

If the multisensory design is implemented and customers feel included, the airport will profit since more customers will be motivated to spend. Customers arrive at a final decision about their future

purchase intention based on their overall experience with the service provider as well as the costs of services (Olsen & Johnson, 2003). The financial profitability of airlines is therefore greatly dependent on consumer pleasure. Research suggests that customer satisfaction predicts future financial performance (Behn & Riley, 1999; 5 C. D. Ittner & Larcker, 1998; Sim, Song, & Killough, 2010).

2.6.1. Impacts on Airports

The multisensory design makes airports more than just transit points. It transforms them into enjoyable destinations, improving the overall comfort and satisfaction of passengers. Pleasant environments reduce travel stress, potentially making air travel more appealing.

Unique multisensory designs make airports stand out. They may become recognizable icons that draw more travellers and airlines. For instance, Changi Airport in Singapore is a destination unto itself because of its distinctive attractions, like the Butterfly Garden and Rain Vortex.

The notion of "destination image" is proposed in the framework in relation to the common saying that the airport represents the destination (Kazda & Caves,2007)

An engaging airport environment can encourage passengers to spend more time in retail and dining areas, boosting sales. Comfortable and stimulating environments can lead to passengers arriving earlier and spending more time shopping or dining.

Memorable sensory experiences can lead to positive word-of-mouth, enhancing the airport's reputation. This can be a deciding factor for passengers when choosing connecting flights, potentially leading to repeat business.

A multisensory approach can also address wellness and accessibility, making airports more inclusive. For instance, tactile paths and auditory aids can assist visually impaired travellers, while calming scents and sounds can soothe anxious passengers.

2.6.2. Impacts on Tourism

Initial and Final Impression: People frequently form their first and last impressions of a place at airports. A satisfying experience at an airport may make a lasting impression, establish the tone for the whole journey, and promote return trips to the location.

Cultural elements, such as artefacts, paintings, or unique interior design, entice travellers to take pictures, upload, and share them on social media to represent the roles of tourists before leaving the destination (Neuhofer et al., 2013). This approach can be an important destination-marketing tool (Hays, Page, & Buhalis, 2013)

Innovative airport design can become part of a destination's image and marketing strategy. It can symbolize the destination's values, such as innovation, luxury, or cultural richness, influencing tourists' choice of destination.

Visitors may immediately experience the local way of life at airports that have integrated local art, food, and cultural features into their architecture. This may heighten visitors' interest and enthusiasm about the destination.

Improved airport experiences can lead to increased passenger traffic, benefiting the local economy. Tourists who have positive airport experiences may be more inclined to spend in the destination.

Airports that successfully implement multisensory design set new standards in the tourism industry, inspiring other sectors like hotels, restaurants, and attractions to adopt similar approaches for enhancing customer experiences.

2.7. Importance of Passenger Experience at Airports

Multisensory design holds a greater significant potential when it comes to enhancing the tourism experience. Travellers may have more immersive, pleasurable, and memorable experiences when they engage many senses in tourism since every touchpoint counts. Here are some relationships between multisensory design and different facets of tourism:

2.7.1. Destination Experience

Travel places that arouse the senses may provide a more long-lasting experience. A deeper travel experience may be optimized by, for instance, the distinctive noises of a city, the flavours of the Indigenous cuisine, the enticing appearance of attractions, the tactile pleasure of local crafts, and the aromas of the natural world around you.

Cultural activities and events that involve travellers' participation also exist in some airports to enhance the place meanings and destination image (DKMA, 2014).

Memory and sensory experiences are strongly related. Experiences that appeal to numerous senses increase the likelihood that travellers will remember and treasure the location.

2.7.2. Hospitality and Lodging

Hotels and resorts use multisensory design to create welcoming atmospheres. This might include visually pleasing décor, ambient music, signature scents, luxurious bedding for tactile comfort, and exceptional dining experiences.

Sensory elements help build a hotel's brand identity, making it stand out in a competitive market. A unique sensory experience can become a defining feature that guests associate with the brand.

2.7.3. Cultural Attractions and Museums

Museums and cultural attractions increasingly utilise multimodal design to make exhibitions more engaging. Interactive installations, tactile exhibitions, and ambient soundtracks may enhance cultural discovery.

The staged setting, by using the cultural artefacts, art pieces, and sculptures in the airport terminal, project the form of object-authenticity (Wang, 1999), which is a long-addressed element of the tourist experience (Ritchie & Hudson, 2009).

This is also improved via multisensory design, which allows individuals of all abilities to enjoy and participate in exhibits.

2.7.4. Transportation and Travel

Airports, train stations, and even public transportation may benefit from multisensory design to promote traveller comfort and pleasure. This includes clear visual signage, announcements that are simple to hear and comprehend, clean and pleasant waiting spaces, and providing a variety of food and beverage options.

Well-designed sensory settings in transit zones may significantly lessen the tension and worry frequently connected with travel.

2.7.5. Restaurants and Gastronomic Experiences

Though the taste is essential in culinary experiences, the visual appeal of the setting, the ambience, the aroma of the meals, and the physical experience when one consumes it all play crucial parts in determining overall satisfaction.

Restaurants frequently utilize multimodal design to create thematic experiences in which the ambient matches the cuisine and enhances the eating experience.

2.7.6. Event and Experience Design

Festivals, concerts, and themed events frequently rely on multimodal design to create fascinating experiences. The mix of visual spectacle, music, and other sensory aspects makes events unforgettable.

For example, Virtual and augmented reality tours may engage many senses and provide unique ways to explore locations.

2.7.7. Marketing and Promotion

Using sensory aspects in tourism marketing may help create appealing storylines. A promotional movie, for example, can accentuate a place's sounds and visuals, while a travel brochure might utilize textured material to indicate luxury.

Multisensory design is a valuable instrument in the tourism sector. It improves the quality of visitor encounters, fosters happy memories, and can even influence destination and service selection.

Social media marketing, together with popular trends of social networking activities, such as hashtags (Mcfedries,2013), enhances the roles of airports from a mere supporting place for experiences (Cary, 2004; Volo, 2009) to a place where the mental linkage of passengers to the destination can be solidified.

Tourism companies may create more engaging, fulfilling, and accessible guest experiences by deliberately combining sensory aspects.

2.8. Applying Multisensory Design in Airports

Airport spaces have yet to be fully considered in multisensory design. Some airports have begun experimenting with this approach; for instance, Changi Airport's butterfly garden offers a soothing visual, olfactory, and auditory experience (Yan & Peeta, 2020). Unfortunately, Comprehensive research on how multisensory design could boost airport traveller experiences is still limited. Despite being a new idea, multisensorial design's full potential is still not immediately apparent. There are, at present, no models that illustrate the effects of leveraging sensory design for improving the user experience while producing a favourable impression of the organization, given past research findings on using multisensory design in the tourism industry.

Multisensory design at airports is creating an environment that stimulates passengers' sight, hearing, smell, touch, and taste. Each component is critical to improving the overall airport experience. Here is a closer look at each of these features in the context of airport design:

One must effectively use both artificial and natural light. Natural light may boost mood and vitality, while softer lighting in lounge areas can provide a calming feel.

Colour choices can influence mood and perception. For instance, calming colours like blues and greens might be used in relaxation zones, while vibrant colours could be employed in areas that energize, such as shopping zones.

2.8.1. Sight (Visual Design)

Signage and Wayfinding: Clear, visually appealing signs aid in easy navigation and decrease passenger stress levels. Digital signage may also display other dynamic, real-time data.

Art installations, architectural beauty, and interior design enhance visual attractiveness. Themed design can represent local culture, including the airport, in the tourist experience.

The pleasing appearance and properly maintained surroundings add to a favourable opinion of the airport.

2.8.2. Sound (Auditory Design)

It is critical to manage and minimize undesirable sounds (e.g., loud announcements, aeroplane noise). Acoustic design and soundproofing can aid in this regard.

In specific airport places, soft, peaceful background music may improve the environment and minimize tension.

Clarity and volume of public announcements are important. Overly loud or frequent announcements can be disturbing.

2.8.3. Smell (Olfactory Design)

Introducing a subtle, pleasant scent can significantly improve the passenger experience. Scent branding is also becoming popular.

Maintaining the appropriate air quality via adequate ventilation and air filtration devices ensures the airport atmosphere remains fresh and odor-free.

2.8.4. Touch (Tactile Design)

Convenient seats in lounges and waiting rooms are fundamental. This includes comfortable couches, ergonomic seats, and sleeping pods at certain airports.

Soft materials like carpeting or smooth check-in counters can add to the tactile experience.

Touch-based interactive installations, such as information kiosks or art exhibits, can enhance engagement.

2.8.5. Taste (Gustatory Design)

An extensive array of culinary choices, spanning from light bites to elaborate feasts, accommodates a variety of palates and can constitute a noteworthy aspect of the aviation encounter.

Providing tourists with a flavour of the place before they even leave the airport may be achieved by featuring local culinary delights.

The integration and coordination of these parts to produce a seamless and pleasing experience are critical for the success of multisensorial designs at an airport. It consists of:

Careful planning to ensure that all sensory aspects complement one another and meet the functional demands of various airport sections (e.g., check-in, lounges, gates).

Tailoring sensory experiences to different passenger zones, such as family areas, business lounges, or quiet zones.

Incorporating local cultural elements to create a unique and memorable airport identity.

2.9. A Gap in the Literature

While the above studies have touched upon elements of our research topic, a gap still exists in understanding how to strategically implement a multisensory design in airports specifically to enhance tourist experiences. There are no concrete frameworks to direct the integration of multisensory design into airports and assess its effect on visitor happiness and the entire airport experience.

This research study has demonstrated that optimising airport experiences is essential to enhancing travel experiences. Airport visitor experiences should potentially be improved, considering the multisensory design technique's success in other areas. This research develops and evaluates a novel theoretical framework for the successful use of multisensorial design at airports in an effort to fill the gap in pre-existing research

CHAPTER THREE

3. Research Methodology

3.1. Research Design

The approach used has been created to gather quantitative data that spans various traveller perceptions and engagements within the airport environment, considering the subjective and complex nature of human sensory experiences. The goal is to obtain a more profound comprehension and supporting evidence. This research's design necessitates collecting quantifiable data that quantifies experience enhancement.

This research study will be carried out at Heathrow International Airport, one of the biggest airports in the UK. Heathrow Airport presents a prosperous position for studying the use and effects of multisensorial design features in one of the largest transportation hubs in the world. The selection was shaped by the knowledge that this airport serves as a global hub and supplies an assortment of tourists from whom data can be collected.

The International Air Transport Association (IATA) has pointed out that optimizing the sensory experience in airports may result in higher dwell hours spent in retail sections, boosting commercial earnings. Therefore, this phase will use Heathrow Airport as a case study of an airport that has implemented elements of multisensorial design. Statistical analysis will be conducted to compare the satisfaction levels of tourists alongside other relevant indicators in this type of airport compared to traditional airports.

A comprehensive survey will be designed. The questionnaire will be presented to a sizable and diverse group of visitors to guarantee accurate representation.

3.2. Data Collection Methods

3.2.1. Sociodemographic questionnaire

A sociodemographic questionnaire will be prepared to retrieve significant data, such as age, gender and travel reasons. Incorporating a sociodemographic survey in the dissertation allows for a comprehensive examination of how multisensory design elements impact diverse passenger populations, facilitating more inclusive and effective design strategies in airport environments. “Rigorous polls follow well-established social scientific methods to ensure that the characteristics of the survey’s sample mirror the characteristics of the entire population. (NW et al., 2014). It will

be included in the ASQ survey, which will be discussed below.

3.2.2. Airport Service Quality (ASQ) Survey

A Likert Scale questionnaire will contain statements regarding the various categories of sensorial experiences at the airport, including sight, hearing, scent, taste, and touch. Each statement will be followed by a five-point scale, with the points labelled as follows: “1,” poor; “2,” fair; “3,” good; “4,” very good; and “5,” excellent. However, a Yes/No scale will be utilised for some inquiries.

Airports Council International (ACI) created the Airport Service Quality (ASQ) Survey to offer airports feedback on how users view their level of service. Airports that have already implemented some kind of multisensorial design, such as Singapore Changi Airport and Hamad International Airport, are proof of its level of effectiveness, as they have been known to use this survey tool.

ASQ surveys cover a wide range of service quality aspects, which ensures that the study captures all relevant dimensions of the airport experience and provides a holistic understanding of passenger perceptions. The passenger-centric nature of ASQs ensures that the survey questions are relevant to their needs and perceptions. Airports with multisensory components typically score higher in passenger satisfaction surveys, according to Airports Council International (ACI) research. For instance, passengers tend to feel more at ease and enjoy themselves at airports with dynamic lighting and calming soundtracks, which improves overall ratings.

The survey questions will be assessed using a small sample of respondents to verify that they are concise, unbiased, and will yield beneficial outcomes. The survey may also be distributed online via various social media platforms using Google Forms. All information received will be recorded in a database by hand. The survey instrument is based on the existing literature of Chiappa, Atzeni & Loriga (2019). The first section was an introduction to the survey. Respondents were required to provide their sociodemographic information (e.g. age and gender) and travel-related habits (frequency of travel, purpose of travel, etc.) in the second section. In the third to eighth sections, respondents were asked to assess their level of agreement with fifteen items specifically selected to measure all five multisensorial elements present at the airport. The final three items are satisfaction and intention to recommend the airport to others. The 18 items used to measure aesthetics were framed based on existing literature (for instance, Turley & Milliman, 2000) and

readapted for this dissertation. This allowed a theory-in-use approach (Zaltman, LeMasters & Heffring, 1982). Below are the questions that will be presented to respondents on the survey:

SURVEY QUESTION	OBJECTIVE	REFERENCES
What age group do you fall under?	Segment people for focused experiences by recognising trends and patterns and comprehending what the population comprises with the aid of this data. Sociodemographic information also contributes to the validity of research and aids in identifying differences and imbalances within groups of people. In the end, various possibilities are facilitated from these surveys, guaranteeing that experiences are customised to meet the diverse demands of various population groups.	Demographic information gives data on research participants and is required to determine whether the individuals in a particular study are a representative sample of the target population for generalization purposes (Hammer, 2011).
What is your gender?		
What is your highest educational accomplishment?		
What is your status of employment?		
What is your reason for travel?		
How frequently do you take flights?		
1. Rate the influence that the lighting (natural and artificial) at Heathrow Airport has on your travel experience.	To evaluate passengers' perceptions of visual elements and their contribution to the airport experience.	Introducing soothing colors, natural lighting, and clear signage are key factors in creating an environment that mitigates stress. Studies indicate that design features can evoke specific neural signatures that associate with relaxation and comfort (Nicola, 2024)
2. How appealing is the architecture, design and arrangment of the retail stores in Heathrow airport?		
3. How would you rate the interior design of Heathrow Airport (including the lighting, signs for wayfinding, billboards and art pieces) when it comes to visual appeal?		
4. To what extent do you find the announcements at Heathrow Airport clear and easy to understand?	To assess the effectiveness of auditory design elements in enhancing the passenger experience by reducing stress and creating a pleasant atmosphere.	Aircraft noise annoyance decreased with an increase in background noise level using field noise measurements and a social survey (Lim et al., 2008)
5. How do the auditory elements at Heathrow Airport affect your stress levels and overall mood during your travel experience?		
6. Concerning aspects like background music and noise levels, how pleased are you with the sound conditions at Heathrow Airport?		
7. In what category would you place Heathrow Airport's air quality?	To ascertain how scent affects travellers' comfort levels and perceptions of the airport.	The functional use of scent in a passenger transport/travel context includes everything from the suggestion that ambient scents could be used to help reduce anxiety amongst the 40% of passengers who report that flying makes them anxious (Strutner, 2015)
8. To what extent do you find the aromas and smells employed in the various sections of Heathrow Airport pleasant?		
9. How much do the smells at Heathrow Airport contribute to your sense of relaxation and well-being?		

10. How comfortable do you find the seating areas at Heathrow Airport?	To gauge passengers' satisfaction with tactile components that enhance physical comfort, such as seat comfort and material quality.	The physical environment of the airport can influence perceptions of the overall quality of the service encounter. (Fodness and Murray, 2007)
11. How much do interactive features (such as touch displays and interactive maps) improve your Heathrow Airport experience?		
12. How would you grade the comfort levels and quality of the tangible items you came into contact with (such as handrails and chairs)?		
13. Regarding Heathrow Airport's food and beverage selections, how would you rank their quality and variety?	To assess the influence of taste on the entire airport sensory experience and the caliber and diversity of food and beverage options.	Han et al. (2012) found that the three main factors significantly predicting lounge patrons' inclination to return are environment, employee service, and food and beverage service.
14. To what extent did you find the food and drink selections at Heathrow Airport satisfactory?		
15. Rate how much the taste experience (i.e., food quality, taste) plays a role in your perceived overall satisfaction with Heathrow?		
16. Which rating would you give Heathrow Airport's overall interior design?	To gauge the general satisfaction level of passengers with their overall airport experience, serving as a baseline for assessing the impact of multisensory design elements.	A strong brand is one that can capitalize on the human senses that can enhance, affirm and create trust with the customers. Sensory marketing is a technique that aims to seduce the consumer by using his/her senses to influence feelings and behavior. Senses are strongly linked to our memories and emotions. (Nandagopal, 2015)
17. After visiting Heathrow Airport, how satisfied were you with your entire experience as a whole, taking into account all the senses engaged (sight, smell, sound, touch and taste)?		
18. How would you rate the overall quality of your experiences at Heathrow Airport in influencing your likelihood to recommend it to others?		

Table 3.1: Survey Questions

Using specific questions related to multisensory design within the ASQ framework helps isolate the impact of multisensory design. By using a respected and widely accepted evaluation framework, the study reinforces Heathrow Airport's commitment to high service quality standards. Creswell underscores the need for clear, concise, and contextually relevant questions to capture nuanced data from survey respondents.

3.3. Data Analysis Techniques

For this research, author used IBM SPSS Statistics (Statistical Package for the Social Sciences), one of the most widely used statistical software tools, suitable for handling large datasets.

With the collected data is intended to determine the average rating for each sensory experience by using measures of central tendency, specifically the mean. For each sensory category, the mean will be calculated (or average rating).

By comparing these mean ratings, the research can discover which sensory experiences were evaluated better on average and which were rated lower.

ANOVA will be used since it helps to compare more than two groups. If the *p-value* is less than 0.05, the hypothesis will be rejected as null, and it will be concluded that there are statistically significant differences between the groups.

CHAPTER FOUR

4. Results/Discussion

4.1 Introduction

This chapter focuses on analysing and critically interpreting the data gathered from the participants at Heathrow Airport in the United Kingdom through the Google form link sent to them. The data were cleaned and transformed. The data returned consisted of 493 data sets, meaning that 493 participants participated. Charts and tables were represented respectively where necessary to describe the participants' socio-demographic characteristics. Also, the average rate (mean) and the ANOVA analysis were adopted to address the research objectives, as shown in the subsequent paragraphs. The test for the study's reliability was also employed.

4.2 Reliability Test

Figure 4.1: Reliability Test

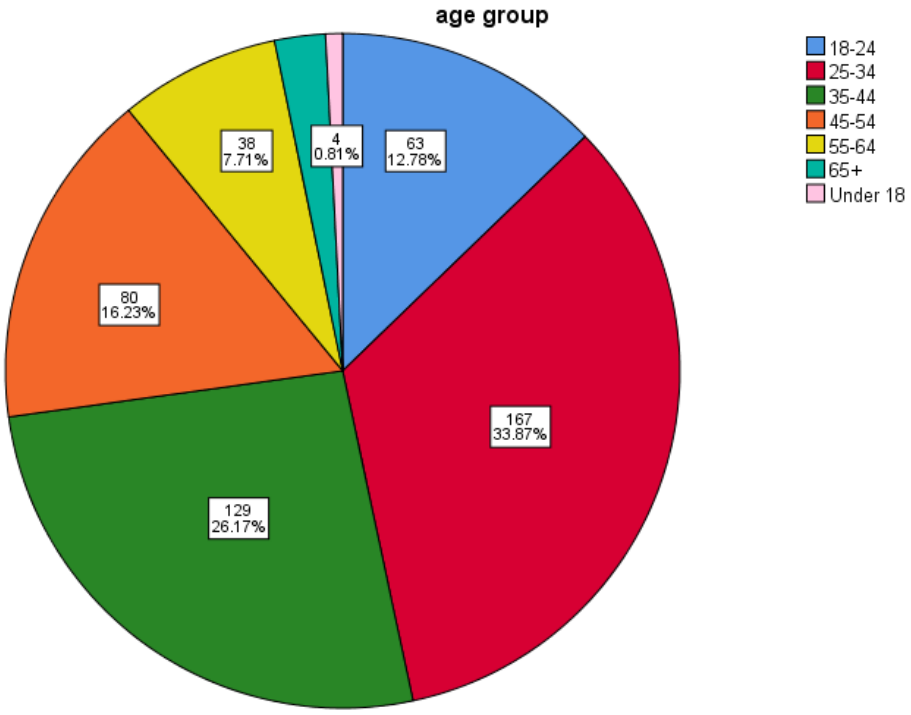
Reliability Statistics

Cronbach's Alpha	N of Items
.982	18

Table 1 above revealed .982 as the Cronbach's Alpha result from the 18 survey questions set to address the research objectives. This implies that the survey questions are strongly reliable, consistent and trustworthy to be administered to the study participants. The reason is that Daniel and Frederick (2018) posited that reliability results greater than 0.80 are said to be excellently reliable, and their measures are consistent internally. Also, Cronbach's Alpha results that exceed 0.9 according to Statistics How To (2024) and Johnson, (2021) are said to have demonstrated a high level of reliability that suggests that the survey questions are well-correlated and measure the underlying construct effectively.

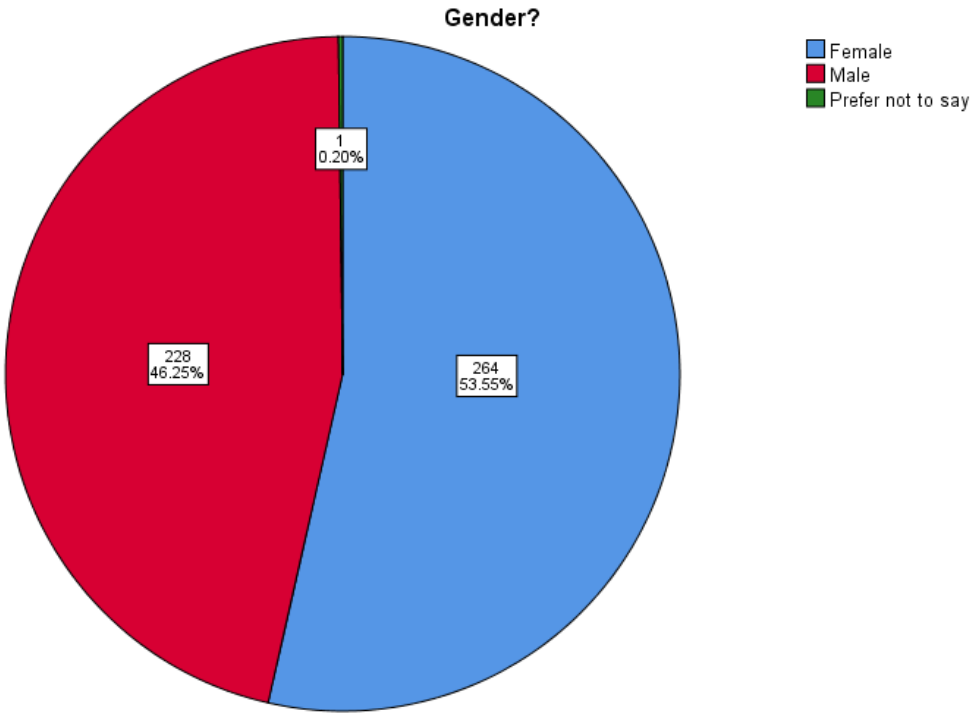
4.3 Socio-demographics and flight-related characteristics of survey participants

Figure 4.2: Age group



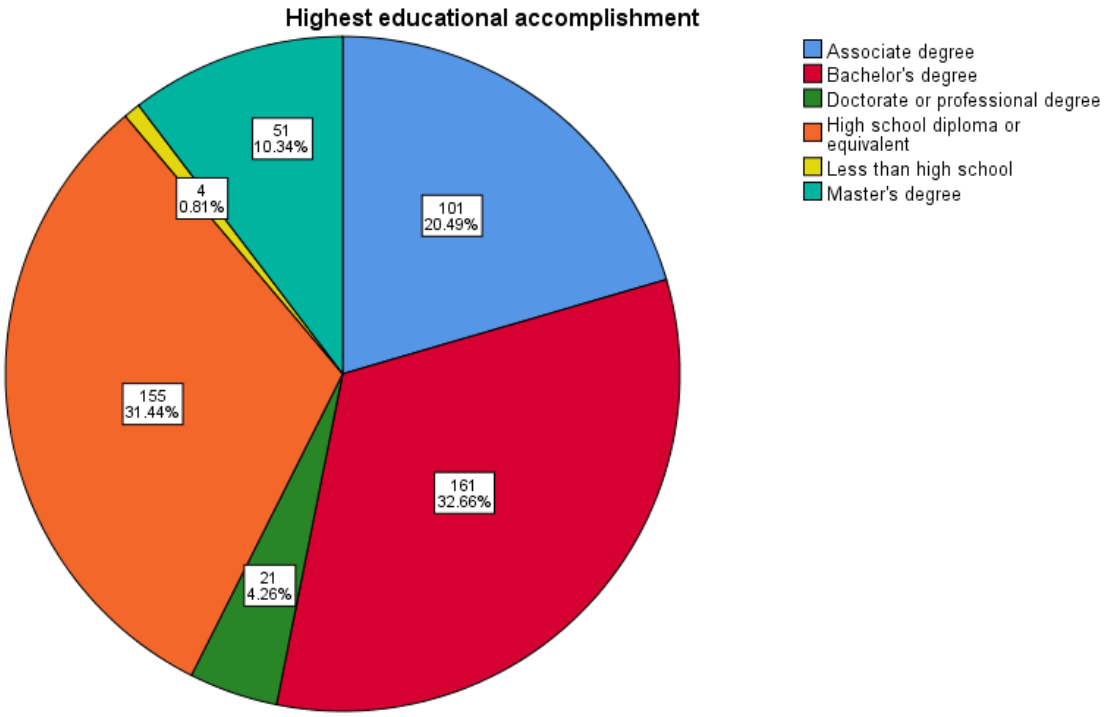
As shown in Figure 1, 33.87% of the participants were between 25 and 34 years old. This is followed by 26.17% of those between 35 and 44 years. The meaning is that many participants comprise younger to middle-aged adults, implying that these individuals participated most in tourism and airport experiences. On the other hand, the data consist of 16.23% of participants between 45 and 54 years, while those who are 55 years old and older than that make up 10.1%, while just 0.81% are represented below 18 years in the study. This further emphasizes the significance of working-age adults in influencing the tourism experience at Heathrow Airport in the United Kingdom.

Figure 4.3: Gender



In Figure 2, it was revealed that there is more female participation than male participation, where 53.55% of females participate more, unlike 46.25%, while 0.20% prefer not to mention their gender. This fair distribution accounts for the fact that the opinions of both genders were highly considered and effectively taken into account when assessing the influence of multisensory design on airport experiences. These almost equal representations of both genders (male and female) allowed the participants the ability to offer inclusive perspectives and evaluate how multisensory design elements improve airport experiences for different types of travellers.

Figure 4.4: Highest Educational Accomplishment



The data distribution above revealed that 32.66% of the participants had a Bachelor's degree as their highest form of educational accomplishment. This also marked that most participants in the data set had this accomplishment. Meanwhile, other participants of about 31.44% had a high school diploma or its equivalent while 20.5% of them had their associate degree. Aside from that, 10.34% had their Master's degree while 4.26% attained a doctorate or professional degree. In contrast, only 0.81% had less than a high school education. Summarily, it implies that most of the participants have completed their high school studies, suggesting that the participants are knowledgeable to evaluate the effect of multisensory design on airport experience.

Figure 4.5: Status of employment

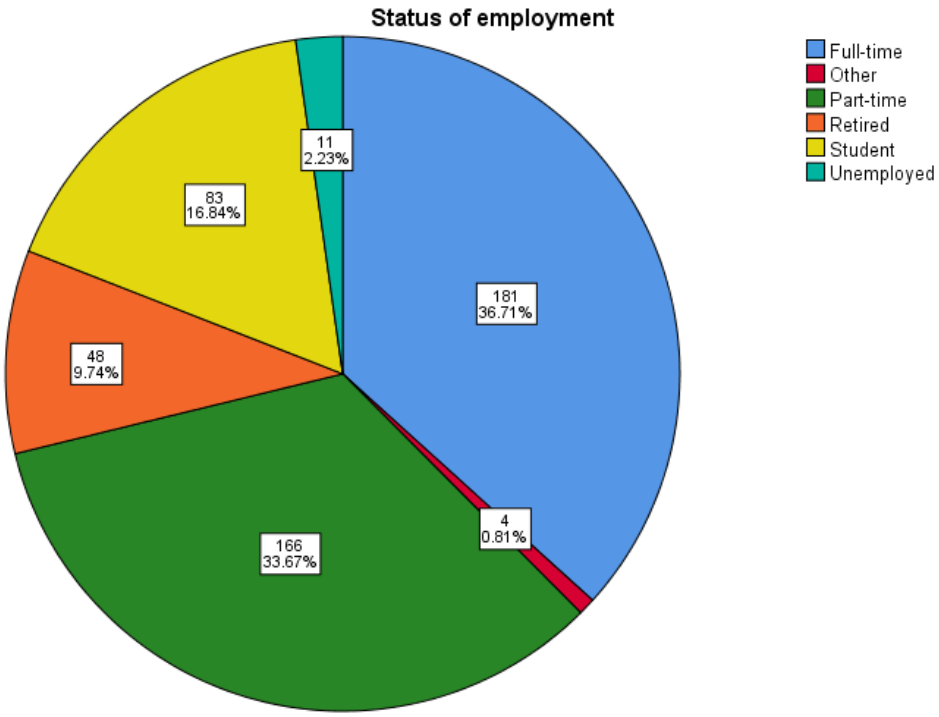
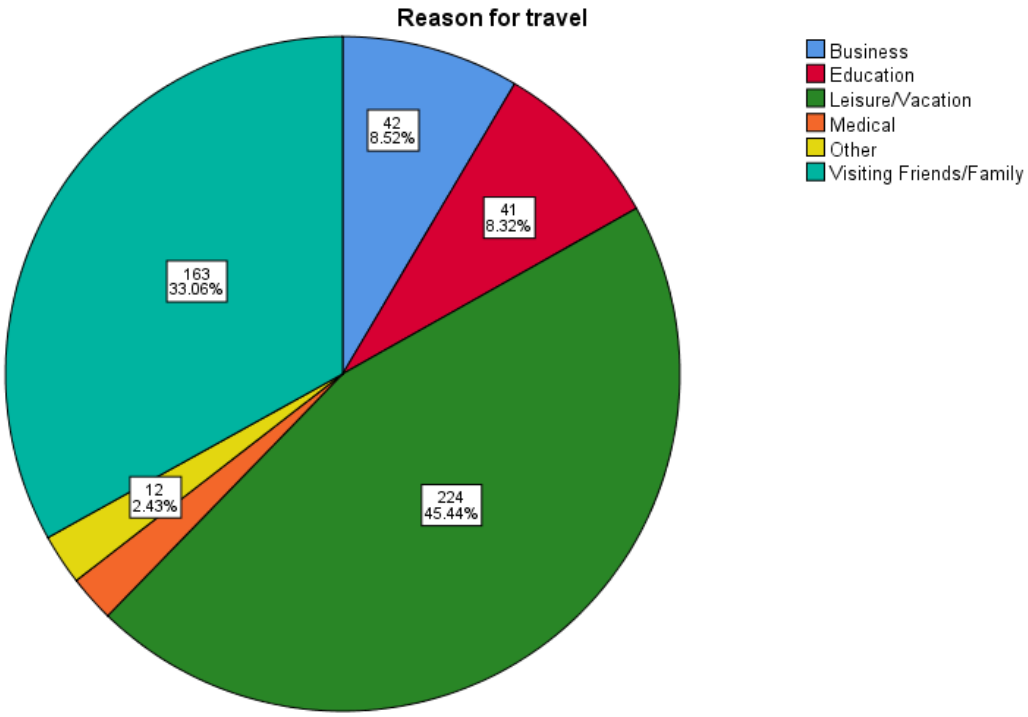


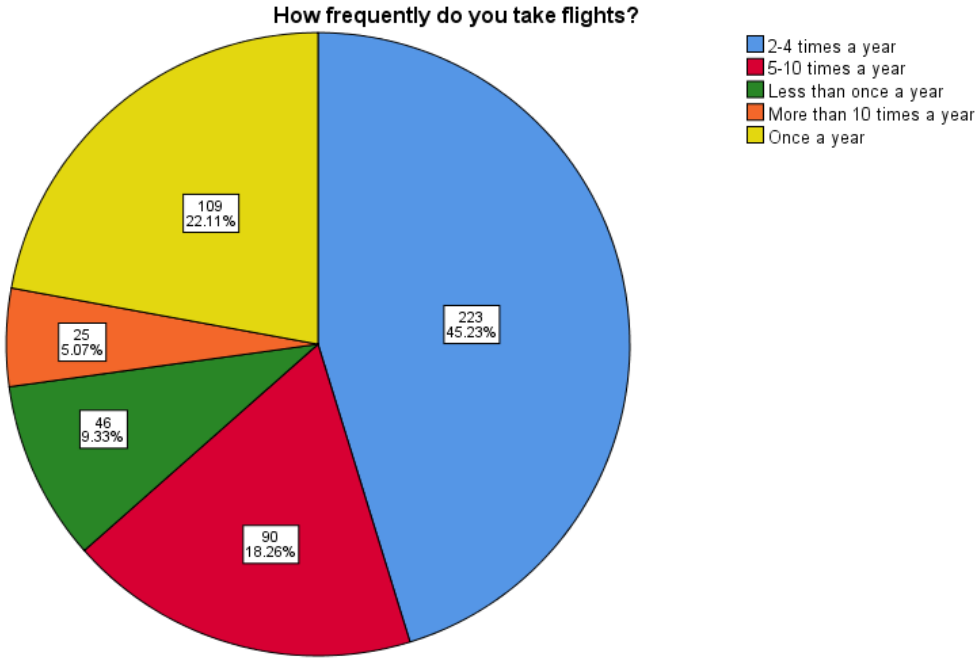
Figure 4 indicated that 36.71% of the participants are mostly working as full-time employees while 33.7% are part-time workers, implying a considerable engagement in the labor force. On the contrary, 16.84% of the participants were students, showing a significant proportion of participants merging their school work and jobs. On the other hand, the data shows 9.74% of retired people and 2.23% of those who ran out of jobs. This implies that most of the participants are engaged in the workforce. Notably, the presence of "Other" at 0.81% revealed some special and indecisive employment/job status that needs further investigation for clarity.

Figure 4.6: Reason for travel



The data distribution in Figure 5 demonstrates the rationale behind why the participants use the airport. In light of this, it was revealed that 45.44% of the participants mentioned that they use the airport to travel for leisure and/or vacation. This choice represents the highest percentage unlike that of 8.52% of them responding that they use the airport for business travel, implying that it plays a major role but it is not the main factor that propels the airport activity. Other participants 33.06% claimed that they use the airport to travel to see family and friends, underscoring the value they have for social relationships in driving travel motives. Education (8.32%), medical and other reasons (2.43%) may not be as common but they in some ways showcase the different functions of airports. Therefore, it could be said that the data above shows the significance of incorporating the multisensory design features that appeal to different participants' preferences of various groups of travellers.

Figure 4.7: Frequency of taking flight



The data regarding how often participants fly shows that almost half of the individuals, 45.23% take flights 2-4 times annually, indicating that this is the most popular flight trend among the participants. Furthermore, 22.11% of the group travels once a year, while 18.26% travels 5-10 times annually. Only a small percentage of participants, 5.07% take more than 10 flights a year, while 9.33% fly less than once annually. This data indicates that most participants are average travellers, which could impact how they respond to multisensory experiences in airports, as frequent fliers may have varying expectations from occasional travellers.

4.4 Descriptive statistics

As discussed in Chapter Three, this section will be using the Likert scale; 1," poor; "2," fair; "3," good; "4," very good; and "5," excellent to address the survey questions associated with each of the variables in the research objectives respectively using the average rating or mean method for each sensory experience. The criterion mean, according to Nwankwo (2016), will be used as a

yardstick to compare the mean from the survey questions either to accept or reject where necessary.

It could be derived mathematically as $\frac{1+2+3+4+5}{5} = \frac{15}{5}$ = **3.00** based on the Likert scale above.

This implies that the average rating or mean method from the survey question ≥ 3.00, will be accepted and vice-versa. It can also be indecisive if the average rating or mean method from the survey question = 3.00.

4.4.1 Significance of Multisensory Stimuli

Figure 4.8: Significance of Multisensory Stimuli

	N	Mean	Decision
Rate the influence that the lighting (natural and artificial) Heathrow Airport has on your travel experience.	493	3.04	Accepted
How would you rate the interior design of Heathrow Airport (including the lighting, signs for way finding, billboards and art pieces) when it comes to visual appeal?	493	3.11	Accepted
How do the auditory elements at Heathrow Airport affect your stress levels and overall mood during your travel experience?	493	2.80	Rejected
In what category would you place Heathrow Airport's air quality?	493	2.83	Rejected

The interpretation of the result above showcases the mixed responses of the participants about the relevance or significance of Multisensory Stimuli. For instance, it could be seen that both natural and artificial lighting responses have a mean rating of 3.04, implying that they positively influence the experiences of travellers at Heathrow Airport. Similarly, visual appeal which includes the interior designs in the airport and its signage had a mean rating of 3.11, reinforcing its relevance in shaping the experience of travellers at Heathrow Airport. Meanwhile, auditory elements with a

mean rating of 2.80 were rejected suggesting perhaps the sound-related stimuli might have a negative impact on passengers' mood and stress levels. Also, air quality with a mean rating of 2.83 received a rejected decision, pinpointing to the potential dissatisfaction of the participants with environmental comfort that might undermine the significance of air quality in the airport.

4.4.2 The Impact of Multisensory Stimuli

Figure 4.9: The impact of Multisensory Stimuli

	N	Mean	Decision
To what extent do you find the announcements at Heathrow Airport clear and easy to understand?	493	2.90	Rejected
Concerning aspects like background music and noise levels, how pleased are you with the sound conditions at Heathrow Airport?	493	2.60	Rejected
To what extent do you find the aromas and smells employed in the various sections of Heathrow Airport pleasant?	493	2.80	Rejected
How much do the smells at Heathrow Airport contribute to your sense of relaxation and well-being	493	2.78	Rejected
After visiting Heathrow Airport, how satisfied were you with your entire experience as a whole, taking into account all the senses engaged (sight, smell, sound, touch and taste)?	493	3.00	Undecided

Figure 8 mostly revealed the negative perception of the participants at Heathrow Airport. First off, announcements were rated with a mean value of 2.90 because these announcements were unclear and difficult for them to understand. In the same vein, participants' dissatisfaction was expressed concerning the music background and the level of noise over there with a mean rating of 2.60. This also includes the aromas and their contribution to relaxation with mean ratings of 2.80 and 2.78. On the other hand, the mean rating of 3.00 shows that the participants did not completely reject the multisensory experience, yet the overall sensory engagement suggests that there was no

specific outcome that stood out. In general, perhaps the multisensory design at Heathrow Airport may not be sufficient because the results above showcase that the multisensory design efforts fail to significantly enhance tourist experiences. Hence, the need for improvements across sensory elements to meet the expectations of passengers.

4.4.3 Tourism in the airport

Figure 4.10: Tourism in the airport

	N	Mean	Decision
How appealing is the architecture, design and arrangement of the retail stores in Heathrow airport?	493	3.11	Accepted
How would you grade the comfort levels and quality of the tangible items you came into contact with (such as handrails and chairs)	493	3.04	Accepted
Regarding Heathrow Airport's food and beverage selections, how would you rank their quality and variety?	493	3.02	Accepted

The result revealed that the participants were moderately satisfied with their tourist attractions at the airport. The reason is that they claimed a mean rating of 3.11 suggesting that the visual and spatial arrangement notably contributed to the airport experience. The tactile quality of tangible items like handrails and chairs had a mean rating of 3.04, showcasing that comfort plays an important role in enhancing the participants' overall satisfaction. However, the food and beverages with a mean rating of 3.02 indicate that there may be avenues for improvement in the variety and quality of dining experiences.

4.4.4 Improving Airport Experiences

Figure 10, with a mean rating of 2.84, revealed that the participants were dissatisfied with the seating comfort, food and drink selection with a mean rating of 2.98. This suggests that these

elements do not contribute significantly to their positive experiences. Similarly, the participants' taste experience influenced their overall satisfaction at a 2.98 mean rating. This reflects gaps in the airport's current comfort and sensory engagement offerings. Meanwhile, the interactive features, such as touch display with a mean rating of 3.18, were positively accepted, indicating that digital interactivity enhances the user experience.

Figure 4.11: Improving airport experience

	N	Mean	Decision
How comfortable do you find the seating areas at Heathrow Airport?	493	2.84	Rejected
How much do interactive features (such as touch displays and interactive maps) improve your Heathrow Airport experience?	493	3.18	Accepted
To what extent did you find the food and drink selections at Heathrow Airport satisfactory?	493	2.98	Rejected
Rate how much the taste experience (i.e., food quality, taste) plays a role in your perceived overall satisfaction with Heathrow?	493	2.98	Rejected

4.4.5 Most efficient multisensory design components

Figure 4.12: Most efficient multisensory design components

	N	Mean	Decision
Which rating would you give Heathrow Airport's overall interior design?	493	3.07	Accepted
How would you rate the overall quality of your experiences at Heathrow Airport in influencing your likelihood to recommend it to others?	493	2.94	Rejected

The result shows that Heathrow Airport's interior design was rated moderately positively, with an average score of 3.07, indicating that passengers view it favourably, in line with the study's aim of

pinpointing effective design elements for passenger satisfaction. This shows that the current layout of the airport enhances the user's overall experience. Nonetheless, the average rating of 2.94 for passenger experiences does not substantially impact passengers' inclination to recommend the airport. The refusal of this proposal indicates that, although the design is liked, enhancements in other areas, like service quality or operational efficiency, might be necessary to enhance passenger support.

4.5 Inferential statistics (ANOVA)

This section deals with further appropriateness of the variables (Dependent and Independent) in each of the research objectives to make informed decisions while accounting for uncertainty and to show the relationship between the variables where necessary.

4.5.1 Significance and impact of multisensory stimuli on tourism in airports

Figure 4.13: ANOVA for Significance and impact of multisensory stimuli on tourism in airports

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2419.552	2	1209.776	1264.645	.000[b]
	Residual	468.740	490	.957		
	Total	2888.292	492			

a. Dependent Variable: TIA

b. Predictors: (Constant), TIMS11, SOMS

The sum of squares at 2419.552 explains the amount of variations in Tourism in Airport (TIA) while the sum of squares at 468.740 explains the sum of variations that are not explained in Tourism in Airport (TIA) by the model. Therefore, this sums up to a total of 2888.292 as shown in Figure 12. Also, the p-value at .000 revealed that the model is statistically significant because it is less than 0.05 significant level. This implies that both the Significance and impact of multisensory stimuli had an impact on tourism at Heathrow Airport.

4.5.2 The overall Impact of multisensory design on improving airport experiences

Figure 4.14: ANOVA for overall Impact of multisensory design on improving airport experiences

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3883.419	1	3883.419	1692.957	.000[b]
	Residual	1126.289	491	2.294		
	Total	5009.708	492			

a. Dependent Variable: IAE

b. Predictors: (Constant), OIMSD111

The sum of squares at 3883.419 explains the variations in improving airport experience (IAE). In contrast, the sum of squares at 1126.289 explains the sum of variations not explained in improving airport experience (IAE) by the model. Therefore, this sums up to a total of 5009.708, as shown in Figure 12. Also, the p-value at .000 revealed that the model is statistically significant because it is less than 0.05 significant level. This implies an overall impact of multisensory design on improving airport experiences at Heathrow Airport.

Hence, we can conclude that our hypothesis will be:

Objective 1:

Null Hypothesis: Multisensory stimuli have no significant impact on tourism experiences at Heathrow Airport.

Alternative Hypothesis: Multisensory stimuli significantly impact tourism experiences at Heathrow Airport.

For Objective 1, The null hypothesis was rejected, and the alternative hypothesis was supported that Multisensory stimuli significantly impact tourism.

Objective 2:

Null Hypothesis: Individual sensory elements (e.g., sound, scent, lighting) do not significantly affect passenger experiences at Heathrow Airport.

Alternative Hypothesis: Individual sensory elements (e.g., sound, scent, lighting) significantly affect passenger experiences at Heathrow Airport.

For Objective 2, The null hypothesis was rejected, and the alternative hypothesis was supported. Individual sensory elements significantly affect passenger experiences.

Objective 3:

Null Hypothesis: Multisensory design does not significantly improve the overall airport experience at Heathrow.

Alternative Hypothesis: Multisensory design significantly improves the overall airport experience at Heathrow.

The null hypothesis was rejected, and the alternative hypothesis was supported. Multisensory design significantly improves overall airport experiences.

4.6 Discussion of Findings

Objective 1: The results of this research, which centered on the significance and impact of multisensory stimuli on tourism at Heathrow Airport by incorporating multisensory design, show diverse reactions to different sensory aspects. The findings show that specific sensory factors, such as lighting and aesthetics, enhance tourists' experiences, whereas other factors, such as sound and air quality, diminish the participants' overall satisfaction. This differs from previous studies, which typically focus on the significance of multisensory design to improve user experiences in different situations, such as airports (Dal Palù et al., 2018; Schifferstein, 2011).

The research indicates that both natural and artificial lighting at Heathrow Airport received an average rating of 3.04, indicating a significant impact on travellers' experiences. Meanwhile, the visual appeal, encompassing interior design and signage, garnered a slightly higher average rating of 3.11, underscoring its importance. These results are consistent with previous research, emphasising the significance of visual cues, especially in developing attractive, practical, and aesthetically pleasing spaces (Schifferstein, 2011). Airports that feature well-thought-out visual elements like dynamic digital displays, strategic lighting, and attractive interior layouts improve travellers' overall satisfaction (Hultén, 2013). Using lighting and visual elements strategically can create different atmospheres, like openness, relaxation, or energy, in spaces. This research aligns

with those beliefs, verifying the impact of compelling visual elements on overall traveller satisfaction.

On the other hand, the current research shows discontentment with the audio features, with an average score of 2.80 for sound-related materials and 2.90 for announcements, pointing to problems with sound quality and loudness. This discontent differs from what is usually suggested in previous studies, which claim that good auditory design can greatly improve a person's sensory experience. (Pawaskar & Goel, 2014) Deliberate sound environments, like relaxing music or sounds from nature, have been identified as helpful in decreasing stress and enhancing mood in places such as airports (Pawaskar & Goel, 2014). Yet, in this scenario, the subpar auditory encounter could indicate that the ambient sounds at Heathrow Airport, such as background music and announcements, are not being maximized to enhance a calming or captivating atmosphere. Rather than enhancing the benefits of auditory stimuli as discussed in previously existing studies, they might cause stress or discomfort among passengers.

The participants expressed dissatisfaction with environmental comfort, as indicated by the average rating of 2.83 for air quality, which could impact the overall multisensory experience. On the other hand, previous studies have highlighted the significance of olfactory design in influencing favourable user experiences (Pawaskar & Goel, 2014). Introducing the appropriate scents from natural sources or artificially created can trigger positive feelings and reminiscences, enhancing the overall experience. Nevertheless, the research indicates that Heathrow's air quality is seen as insufficient, potentially because of inadequate ventilation or unpleasant smells, which hinders its ability to improve the travel experience.

Conversely, physical features like chairs and handrails were rated at an average of 3.04, suggesting that passenger comfort is essential for satisfaction. This is supported by prior research indicating that the tactile aspects of design, including material selection, ergonomics, and the overall sensory experience of spaces, can positively impact user satisfaction (Pawaskar & Goel, 2014). The cosy seating and expertly designed tactile features help create a more soothing and enjoyable atmosphere, improving how passengers view the surroundings.

In general, Heathrow Airport's multisensory experience was not particularly notable, receiving an average rating of 3.00, suggesting only moderate satisfaction. This goes against previous studies'

positive perspective on multisensory design, highlighting its ability to improve user experiences significantly (Spence et al. 2014). Airports incorporating multisensory design can make lasting and interactive spaces that lower stress, boost comfort, and elevate customer satisfaction (Schifferstein, 2011). Nevertheless, the findings of this research indicate that the multisensory layout at Heathrow might not be adequate, with evident room for enhancement in different sensory aspects.

The crucial difference between the study's results and current previously existing studies is found in the practical application of multisensory design at Heathrow Airport. Although previous studies indicate that utilizing a multisensory approach effectively can greatly improve experiences, the findings show that Heathrow's current attempts are lacking, especially in auditory and olfactory aspects. Also, although the previously existing studies highlight the ability of multisensory stimuli to generate emotionally captivating and unforgettable experiences, the research results indicated that travellers at Heathrow view these stimuli as not as influential as anticipated. This indicates that although multisensory design shows potential in theory, it needs to be enhanced at Heathrow to meet passenger expectations and improve their travel experience.

Objective 2:

During the analysis of results, participants rated sensory aspects such as announcements, background music, noise levels, and aromas poorly with mean scores ranging from 2.60 to 2.90, indicating that these factors do not greatly improve the airport visit. In contrast to the general body of research, which emphasizes the importance of sensory interaction in enhancing passenger contentment and reducing stress levels. As per Rhoades and Waguespack, (2005), the involvement of the senses is essential in determining the satisfaction of travellers. The difference suggests that while recognizing the significance of sensory elements, airports such as Heathrow may not have successfully integrated or enhanced these aspects.

On the other hand, touch displays were more positively rated by participants, with an average of 3.18, showing a beneficial impact on their experience. This is in line with the changing perception of airports as hubs of experience, as discussed by Bieger et al. (2007), where interactive and immersive features improve the passenger journey beyond basic transportation offerings. The favourable reaction to interactive technology implies that digital engagement could be a modern

way to enhance passenger experiences in airports, even if traditional sensory stimuli are not present.

The analysis of p-values strengthens the significance of multisensory design in enhancing airport experiences, consistent with previously existing studies stressing its value. The statistical significance of $p < 0.05$ indicates that multisensory design has a quantifiable influence on passengers. Yet, the disparity between this statistical discovery and the decreased ratings for certain sensory aspects (such as sound and scent) highlights a complex problem: though the general idea of multisensory design works well, the precision and implementation of each sensory element might require improvement. This differs from the previously existing studies' positive perspective that a carefully planned multisensory design can lower stress and boost contentment, suggesting potential for enhancement in real-world implementations (Neufeld, 2018).

Previous studies indicate that airports are evolving into hubs of experiences, as outlined by Bieger et al. (2007), where the use of multisensory design is essential for making lasting memories. This is in line with the responses for interactive features but differs from the ongoing complaints from passengers about queue dissatisfaction, seating, and stressful processes (Kazda & Caves, 2015). Although the theory focuses on the advantages of multisensory design, there are still practical obstacles to achieving a completely smooth experience, demonstrating a discrepancy between theoretical possibilities and the current passenger experience.

Even though previously existing studies emphasize the increasing importance of incorporating multiple sensory components for immersive airport environments, findings show that certain sensory aspects are still not meeting expectations. The ratings show that interactive technologies outperform traditional sensory inputs such as sound and aroma. This indicates a chance for innovation in the sensory field by enhancing areas like noise control and aroma, and leveraging digital and interactive features' success.

Objective 3:

The results of the research show that the interior design of Heathrow Airport received a somewhat positive rating of 3.07, consistent with past studies emphasizing the importance of visual elements in improving traveller satisfaction. According to Hultén, (2013), visual elements like lighting,

colour schemes, and signage are essential in influencing how consumers perceive things. The high rating of Heathrow indicates that its visual elements, such as carefully designed layouts and aesthetic characteristics, play a key role in enhancing passenger satisfaction. Nonetheless, the research revealed that despite having a collective rating of 2.94, passenger experiences had minimal effect on the airport's likelihood of being recommended, going against prior studies emphasizing the importance of multisensory design in fostering customer loyalty. This lack of connection indicates that even though visual and potentially other sensory inputs (sound, taste, etc.) are valued, they might not be enough to generate strong passenger support without dealing with other operational aspects.

The function of sound and tactile features, as examined by Pawaskar & Goel, (2014), could enhance passenger satisfaction, yet they are not fully utilized, as shown by the results suggesting a need for enhancement. Additionally, though taste and smell can improve the sensory aspect, providing various dining choices, as indicated by Airikka, (2014), and incorporating olfactory design can reinforce brand recognition, these elements were not emphasized as main influencers of customer loyalty. Hence, although the airport's layout seems successful in enhancing instant contentment, more extensive sensory involvement or enhancements in service quality may be needed to achieve the aim of maximizing traveller satisfaction.

CHAPTER FIVE

5. Conclusion and Recommendations

5.1. Introduction

This section discussed and summarized the key findings discovered in chapter four as regards the study objectives while comparing and/or contrasting them with previously existing studies. Afterwards, recommendations, limitations and suggestions for further studies were documented where necessary.

5.2. Conclusion

The crucial difference between the study's results and current previously existing studies to address objective one is found in the practical application of multisensory design at Heathrow Airport. Although previous studies indicate that utilizing a multisensory approach effectively can greatly improve experiences, the findings show that Heathrow's current attempts are lacking, especially in auditory and olfactory aspects. Also, although the previously existing studies highlight the ability of multisensory stimuli to generate emotionally captivating and unforgettable experiences, the research results indicated that travellers at Heathrow view these stimuli as not as influential as anticipated. This indicates that although multisensory design shows potential in theory, it needs to be enhanced at Heathrow to meet passenger expectations and improve their travel experience.

For objective two, even though previously existing studies emphasize the increasing importance of incorporating multiple sensory components for immersive airport environments, findings show that certain sensory aspects are still not meeting expectations. The ratings show that interactive technologies outperform traditional sensory inputs such as sound and aroma. This indicates a chance for innovation in the sensory field by enhancing areas like noise control and aroma, and leveraging digital and interactive features' success.

Additionally, though taste and smell can improve the sensory aspect, providing various dining choices, as indicated by Airikka, (2014), and incorporating olfactory design can reinforce brand recognition, these elements were not emphasized as main influencers of customer loyalty for objective three. Hence, although the airport's layout seems successful in enhancing instant

contentment, more extensive sensory involvement or enhancements in service quality may be needed to achieve the aim of maximizing traveller satisfaction.

5.3. Recommendations

The following recommendations aim to address the gaps identified in the study and offer practical steps for enhancing the airport experience.

1. **Enhancing Visual and lighting design**: The findings from this study show that the aspects of lighting and visual appearance have significant roles in shaping passengers' experiences. Therefore, Heathrow Airport should not stop investing in dynamic visual atmospherics such as thrilling interior design, strategic use of lighting, and appealing signage, since the mean ratings are 3.04 for lighting and 3.11 for visual appearance. However, it could be more appealing if the airport had some specialized features that catch one's attention, such as interactive digital screens or dynamic lighting depending on the time of day or the seasonal changes in the year. This would likely make the surroundings more interactive and enjoyable to be around, which would increase overall passenger satisfaction. Besides that, the rising appeal in crowded areas, like waiting for halls and check-in points, could minimize the lapse of troubles and stresses among the people for a more relaxing atmosphere applicable for travellers.

2. **Addressing Auditory challenges and improving sound design:** These results show a high level of discontent with the sound-related aspects, as the rating of sound components stands at 2.80 and notifications at 2.90. This dissatisfaction shows that Heathrow needs to take up a more conscious attitude regarding the design of the auditory environment. It is bound that Heathrow will make changes to make public announcements clearer and less irritating. Further, integrating soothing background music or other nature sounds in specific nodes has the potential to create a relaxing ambience by lowering anxiety among passengers. It would also contribute to strengthening positive auditory experiences for passengers, as mentioned and evidenced by previous research studies. Heathrow can also utilize different soundscapes depending on the section of the airport to create different environments, including relaxed lounges and more energetic boarding areas. Noise-reduction strategies shouldn't be left out, such as soundproofing loud spaces or using sound barriers.

3. **Improving Air Quality and scent design:** From these research results, it becomes obvious that people are dissatisfied with air quality, rating it on average 2.83. This shows that Heathrow needs to solve the problems of ventilation and consider improving those aspects of the facility's layout that concern smell. Mechanisms of improved airflow, complemented by the introduction of light, and pleasant fragrances in certain areas, could enrich the sensory experiences of passengers. Those airports that have successfully applied scent design, such as branded scents in lounges and corridors, record higher passenger satisfaction levels. Hence, Heathrow could uplift the mood of passengers through subtle, organic fragrances like lavender and citrus being injected into its waiting areas. These do have the potential to make for unique and memorable sensory experiences. However, this cannot be overdone, and the perfumes used must not be allergens, as this may have a very adverse impact on sensitive passengers.

4. **Leveraging Tactile and physical comfort features: the** mean rating of other tangible characteristics, like chairs and handrails, reached 3.04, reflecting that passengers consider physical comfort relevant. In addition, Heathrow Airport needs to develop seating arrangements, as well as the structure of the physical facilities in check-in counters, waiting areas, and transfer stations. Convertible seating, additional charging outlets, and dynamic interactive touchscreens can add to the range of comfort facilities for passengers. Heathrow has the potential to include new materials in its physical design, such as soft textures or silky surfaces, within areas where passengers will be staying for a longer period. Continuing with consistent tactile characteristics in each part of the airport will help create a smooth, pleasant journey and encourage passengers to feel relaxed and comfortable while travelling.

5. **Re-evaluating sensory priorities and digital integration:** It is evident from the current study that there exists a discrepancy between sensorial perceptions and general customer loyalty since while interior design is rated relatively highly at 3.07, overall experiences have a lesser impact on the likelihood of recommendations at 2.94. This indicates that even as passengers appreciate the visual and tactile stimuli presented to them, these kinds of stimuli in and of themselves are not sufficiently useful to create high levels of satisfaction and resultant loyalty. Heathrow's development should focus more on operational aspects of management and efficiency in the services provided with multisensory development. Further development might include the incorporation of more dynamic interactive digital elements, such as personal real-

time information displays or augmented reality helpers, perhaps representing a genuinely modern way of enhancing experiences beyond the realm of traditional sensory design.

6. **Continuous monitoring and adaptive feedback systems:** Heathrow should be able to implement monitoring systems continuously to derive immediate responses from its passengers about sensory experiences. Several interacting touchpoints will be scattered throughout the airport facility, where the travellers can give their critical comments about their experiences and advice on areas that can be improved. The facility should be able to make responsive updates based on real-time information so that changes in multisensory design elements can be made to meet the needs of the passengers.

5.4. Limitations and suggestions for further research

One constraint of this research is the limited attention given to Heathrow Airport, potentially reducing the ability to apply the results to other airports worldwide. Various airports may incorporate diverse multisensory designs in different manners, which regional and cultural aspects can influence. Therefore, conducting broader comparative studies across multiple airports is necessary to thoroughly understand the effects of multisensory design on airport experiences. Another drawback is relying solely on quantitative approaches, like mean ratings and statistical analysis, without incorporating qualitative perspectives. Qualitative techniques such as interviews or focus groups may offer a more profound insight into passengers' subjective experiences and emotional reactions to multisensory stimuli, uncovering insights that cannot be fully conveyed through raw numerical data (Osborne & Grant-Smith, 2021).

The study must also consider individual variations, such as cultural heritage, that influence passengers' interpretation and engagement with sensory experiences. Future research could adopt a segmented approach to examine how different demographics respond to multisensory design elements. Notable dissatisfaction with sound and smell was observed, yet limited efforts were made to improve or integrate these aspects. Future studies should explore innovations like customised auditory experiences or scent-diffusion systems to address these weaknesses. Moreover, while the current research focuses on immediate passenger satisfaction, future work could investigate the long-term impacts of multisensory designs on brand loyalty, stress reduction, and mental well-being during travel.

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Appendix 1: Other analysis using linear regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.915[a]	.838	.837	.97807

a. Predictors: (Constant), TIMS11, SOMS

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.775	.174		4.465	.000
	SOMS	.772	.032	.988	24.398	.000
	TIMS11	-.036	.018	-.082	-2.024	.044

a. Dependent Variable: TIA

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.880[a]	.775	.775	1.51455

a. Predictors: (Constant), OIMSD111

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.354	.244		9.662	.000
	OIMSD111	3.210	.078	.880	41.146	.000

a. Dependent Variable: IAE