Principles of Experience Design for Airport Terminals

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Abstract

The aviation industry has undergone significant changes since the inception of commercial air travel. In the last several years, there has been a shift in focus from operational excellence to the provision of quality passenger experiences. This shift has been articulated in terminal buildings as expanded retail and increased automation. Although these initiatives appear to be passenger focused, they actually stem from operational mandates rather than a true understanding of passenger needs. To date, there is very little knowledge about the passenger experience from a passenger, rather than operational, perspective.

This research begins with an investigation of the current terminal design landscape from the vantage point of the passenger. A paradox is uncovered in the Level of Service metrics that are used as the foundation of space allocation in terminal buildings. The paradox highlights the need to recognize that operational interpretations of experience differ from passenger interpretations of experience. These differences are described in a conceptual model of passenger experience. The conceptual model serves as a framework for the two qualitative field studies conducted in this research.

In field study one, factors that influence passenger experience were investigated. From interviews conducted with 150 passengers at Brisbane International Terminal, time emerged as the primary factor of influence. Field study two involved in-depth interviews with a further 49 passengers, with a focus on investigating the relationship between passengers and the primary factor of influence (time). Analysis of these passenger interviews demonstrated an inverse relationship between passenger engagement and time sensitivity. This relationship resulted in a new segmentation of passengers based on their core relationship with airport time: Airport Enthusiast (engaged, not time sensitive); Time Filler (not engaged, not time sensitive); Efficiency Lover (not engaged, time sensitive) and Efficient Enthusiast (engaged, time sensitive).
The findings from the two field studies were used to validate and extend the conceptual model of passenger experience. The updated model provides a framework for understanding the behavior of passenger in the airport terminal.

The new knowledge about the passenger experience was used to formulate a set of six design principles:

1. The Principle of Incompatibility states that it is not possible to satisfy both time sensitivity and engagement criteria for a given passenger simultaneously.
2. The Principle of Time Sensitivity states that due to differences in passengers’ sensitivity to time, passengers who are time sensitive will occupy a smaller footprint, while passengers who are not sensitive to time will occupy a larger footprint.
3. The Principle of Engagement states that due to differences in the degrees of passenger engagement in the airport environment, passengers who are engaged will occupy a larger footprint, and passengers who are not engaged will occupy a larger footprint if they are not time sensitive, but a smaller footprint if they are time sensitive.
4. The Principle of Retail Expansion states that the total space in the terminal building that is allocated to retail expansion should be in proportion to the size of the engaged and non-time sensitive passenger segment.
5. The Principle of Efficiency states that in order to maximize the returns on passenger footprint invested, the total terminal dwell time for passengers that do not engage in the retail environment should be minimized.
6. The Principle of Proficiency states that future terminal design should be optimized towards efficient processing rather than retail expansion.

The principles and conceptual model constitute a specification for the development of a tool to assist airport planners and designers to optimize the allocation of terminal footprint from a passenger perspective.

In considering the passenger experience from a passenger, rather than operational, perspective, this research makes three key contributions to existing knowledge in the field: (i) identification of a paradox in the Level of Service metrics, (ii) development of a conceptual model of passenger experience and six design principles and (iii) contribution towards advancing the theoretical knowledge about passengers and their experience in an airport terminal.
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Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature:

Date: 7 MAY 2015
Acknowledgements

Art builds upon art, builds upon art... nothing is purely original. We are all inspired by something... or someone. It’s a never-ending chain of ideas... and it’s magical. S.T. Hodnett, Author

This thesis is represents a milestone in the long chain of ideas that have shaped, and been shaped, by my life experiences to date. Some of these ideas have been influenced by colleagues, some by books, some by friends, some by strangers and some by opportune moments of pure magic. I am deeply grateful for all of these sources of inspiration, and, as I often tell my children, would not swap my life “for all the shoes in the universe”.

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Chapter 1. Introduction

Airports are complex environments comprised of interconnecting systems of people, baggage, cargo and aircraft flows (de Neufville & Odoni, 2003; Kazda & Caves, 2007). Since the inception of commercial air travel, the aviation industry has been transformed by a significant number of changes. The effects of deregulation, the introduction of low cost carriers, and the impacts of global economic, environmental and regulatory effects have all contributed to shape the landscape of modern air-travel (Odoni & de Neufville, 1992).

In recent years, the competition in the airline industry has made air-travel accessible to a significant portion of the world’s population (Dresner, Lin, & Windle, 1996; Franke, 2004). As the price of air travel has declined (Friedman, 2010; U.S Centennial of Flight Commission, 2011), its uptake by the public has gone up at a steady rate of growth (IATA, 2004; RITA, 2012b). This growth in passenger traffic, and the projected growth over the next two decades, has created a need to develop new approaches to terminal design (Air Transport Action Group, 2012; Jager & Ofner, 2012).

The growth in passenger traffic has resulted in an increase in the size of the terminal buildings required to process the annual passenger loads. The actual size of these facilities is based on the predictions of the number of passengers travelling though the given airport each year. The measure of recommended building size is determined in part on the Level of Service (LOS) industry metrics (IATA, 2004).

The exact space allocation, or square meters per person, defined by the LOS metrics varies depending on the input factors considered (Correia, Wirasinghe, & de Barros, 2008a; IATA, 2004). Two salient points to note about the LOS metrics are (i) the amount of space allocated per passenger is the same irrespective of their behaviour in the terminal building; and (ii) there is a linear relationship between the number of passengers to be accommodated and the size of the terminal building: as the number of passengers increases, so too does the size of the terminal building.
Given the projected passenger growth for the next several decades, the industry has recognized that current approaches to terminal design are not sustainable (Jager & Ofner, 2012). The size of terminal buildings cannot continue to grow indefinitely. In many cities, the lack of available land for terminal expansion is a limiting factor. However, even in places where land is physically available, it is acknowledged that the costs associated with the creation and operation of exponentially larger terminal buildings are not feasible (Jager & Ofner, 2012). In order to meet predicted passenger loads, the industry recognizes that new paradigms for the design of terminal buildings must be developed (Jager & Ofner, 2012).

In addition to the increasing cost pressures within the industry, there are three other sources of change in the aviation industry that have the potential to significantly influence the shape of terminal buildings of the future. The first of these is the convergence of industry standards, enabling technologies and a public which is ready to embrace these new technologies (ACRP, 2012; Behan & Craig, 2012; Copart, 2012; de Groof, 2012; Fukaya, 2012; IATA, 2004; IATA Corporate Communications, 2011; Jager & Ofner, 2012; Mayer, 2012; Stelling, 2012; Tarbuck, 2012a). The various initiatives related to the automation of airport processes present an opportunity to reduce the size of current passenger footprint in the terminal building (Harrison, 2013c; Harrison, Popovic, & Kraal, 2014). They also have the potential to change the way in which passengers interact with the airport environment, and thus alter the nature of the “passenger experience”.

The passenger experience has emerged as the second force that is propelling changes in approaches to terminal design. The explosion in mobile computing and social networking has amplified the voice of each passenger, for example Carroll (2012). Airport operators can no longer ignore the link between passenger satisfaction and operational profitability (Causon, 2011; Mayer, 2012; Peterson, 2011; Wagnert, 2013). From a terminal design perspective, these changes have resulted in a shift in the role of the passenger from a non-involved party to one who is recognised as an influential stakeholder (Air Gate Solutions, 2011a, 2011b;

The third source of change affecting terminal design is the consequence of commoditization of air-travel (Gillen & Morrison, 2003; Rigas, 2006; Windle & Dresner, 1999). In a commercial environment where consumers expect experiences, a marketplace which delivers commodities is not realising its full revenue potential (Pine & Gilmore, 2011). This is being addressed by the aviation industry through two main initiatives: those aimed at differentiating between airports (de Groof, 2012; Griffith-Jones, 2012; Jandiu, 2012), and those focussed on expanding retail opportunities at airports (Holm, 2012; Nunes Madeira, 2012).

The confluence of increasing cost pressures, automation of processes, expansion of retail, need for differentiation between airports and increasing importance of passenger experience present both the opportunity, and the necessity, to consider new approaches to passenger terminal design. In this research, these issues are explored from the perspective of the passenger. This human centred approach is adopted on the premise that solutions to problems ought to begin with a solid understanding of, and empathy for, the customer and their needs.

The human centred approach to design has been used in many industries, under a variety of different names, including human centred design (Maguire, 2001), usability (Nielsen, 1994), service design thinking (Stickdorn, Schneider, & Andrews, 2011) and affective design (Schifferstein & Hekkert, 2011). Each of these approaches differ in their specifics, however, the thread of commonality that binds them all is the belief that all “insanely great” solutions should begin with the customer experience, not with the ultimate product or technology (Gallo, 2010).

In the aviation industry, there has been a clear shift in the importance placed on the “passenger experience” (Causon, 2011; de Groof, 2012; Mayer, 2013; Wagnert, 2013). This shift, however, has not translated into the inclusion of true passenger needs in the terminal design process. For historical reasons, terminal design and the evaluation of the quality of experience are still largely based on the operational LOS metrics (ACRP, 2011; Correia, Wirasinghe, & de Barros, 2008b; de Barros,
Somasundaraswaran, & Wirasinghe, 2007; Yen, Teng, & Chen, 2001). As identified in this research, a paradox in the LOS metrics (Harrison, Popovic, Kraal, & Kleinschmidt, 2012) presents an obstacle to the inclusion of true passenger needs as an input into the design process (de Neufville & Odoni, 2003).

In taking a passenger oriented approach to address the challenges faced in the design of future airport terminals, this research contributes to existing knowledge about the factors that influence the experience of passengers in the terminal building. In particular, this research explores two key facets of passenger experience:

1. Identification of the key factors that influence the passenger experience, and
2. A deeper exploration of the relationship between the passenger and the key factor(s) of experience influence.

The outcomes of this research are applied towards the formulation of six design principles. The experience design principles, together with the related conceptual model and underlying mathematical equations, can be used as a specification for a tool to optimise the allocation of space from a passenger perspective.

1.1 Research objectives

The broad objectives of this research were to increase existing knowledge about the factors that influence the passenger experience, and use this knowledge to provide practical guidelines for optimising the allocation of terminal footprint (from a passenger perspective).

These main objectives can be broken down into a set of more specific research goals:

1. Develop a deeper understanding of the passenger experience in the terminal building.
2. Develop a conceptual model that describes the factors that influence passenger experience.
3. Apply the outcomes of this research towards developing design principles that can be used to optimise the allocation of space in terminal buildings, from a passenger experience perspective.

4. Apply the outcomes of this research to suggest strategies for the optimisation of passenger footprint allocation in future terminal buildings.

Ultimately, this research aimed to positively impact the future passenger experience in airport terminals, and indirectly, make a small contribution towards enhancing the general tourism industry by opening travel opportunities to those passengers that may have previously been deterred from travel (Bricker, 2005).

1.2 Research questions
In order to meet the objectives of this research, two primary research questions were developed. The first question relates to the investigation of the factors that actually impact the passenger experience in the terminal building:

1.1. Which of the potential factors (time, service, environment, artefact) actually influence the passenger experience?

1.2. What is the relative importance of these factors?

The second question targets a deeper exploration of the relationships between the passenger and their key factor(s) of influence:

2.1. How do passengers relate to their key factor(s) of influence?

2.2. What are the modes of passenger engagement in the terminal building?

The questions posed were researched using qualitative research methods.

1.3 Research approach
The theoretical foundations for this research were based on qualitative research methods. The systematic and theoretically rigorous approach taken in this research provided a degree of confidence as to the reliability and generalizability of the research outcomes (Mays & Pope, 1995).

The investigation of the research questions was decomposed into three phases. In the first phase (contextualisation), theoretical investigation into terminal design
and human experience was conducted. The existing body of work was consolidated into a conceptual model of passenger experience.

The second phase (acquisition) involved the validation of the conceptual model using qualitative methods. The qualitative component included two field studies, each one targeted at answering one of the two research questions identified. The field studies were conducted at Brisbane International Terminal and involved semi-structured interviews and observation of passengers during their departure process. A total of 199 passengers were interviewed in the course of the two field studies. The interview data and field notes were transcribed and analysed using content and thematic analysis techniques (Bauer & Gaskell, 2000; Boyatzis, 1998; Flick, 2009). The outcomes were used to extend the theoretical conceptual model developed in the first phase, and to define four modes of passenger engagement in the airport terminal.

The third phase (synthesis) involved the integration of the research outcomes into a set of six principles of experience design. This phase was enriched though the insights gained from site visits and interviews with aviation industry experts at 16 international airports.

1.4 Contributions to knowledge

This research advances the theoretical knowledge about passengers and their experiences in an airport terminal. In particular, the outcomes of this research formed the basis for the following contributions to knowledge:

1. The identification of the misalignment between operational and passenger oriented perspectives of passenger experience, highlighting the unsuitability of existing LOS metrics for the evaluation of passenger satisfaction (Chapters 2 and 3).

2. The development of a conceptual model of passenger experience which clearly articulates the distinction between operational and passenger oriented perspectives of passenger experience (Chapters 3 and 7).

3. The development of six design principles that may be used to help optimise the allocation of space in passenger airport terminals (Chapter 8).
4. The identification of two strategies for the improvement of potential returns on passenger footprint invested: (i) creating new opportunities for engagement targeting the large segment of passengers that could be converted into spenders; and (ii) consolidating airport processes to improve passenger processing and decrease terminal footprint occupied by time sensitive passengers (Chapter 8).

1.5 Thesis structure
This thesis is comprised of three parts (Figure 1). The first part of the thesis (Chapters 1-3) provides the context for this research from a terminal design and passenger experience perspective. The second part of the thesis (Chapters 4-6) describes the theoretical foundations for this research, and presents the two qualitative research field studies conducted. The third part of the thesis (Chapters 7-9) integrates the research outcomes into tools and guidelines that can be used in an operational context. A summary of each chapter is illustrated in Figure 1.

![Figure 1: Thesis structure](image)

The first chapter introduces the general context for this research by examining the key trends and challenges facing airport terminal design. Through this discussion, passenger experience emerges as being operationally significant by virtue of its direct connection to airport profitability. A gap in existing knowledge is identified:
although passenger experience is deemed as operationally significant, very little is known about it from a passenger oriented perspective. Two research questions are posed to address this gap. The first looks at the factors that influence the passenger experience in practice, and the relative importance of these factors. The second question explores the relationship between passengers and their key factor(s) of influence. The chapter concludes with a summary of research outcomes and contributions to knowledge.

Chapter 2 discusses current terminal design challenges are discussed in the context of the changing aviation landscape and emerging economic shift towards the “experience economy”. Terminal design is examined from the perspective of stakeholders involved. The Level of Service (LOS) metrics are introduced. An inconsistency in the metrics is uncovered in relation to their suitability for measurement of passenger satisfaction. Two examples are presented, illustrating the benefits that can arise when the focus is placed on an understanding of passenger needs, rather than business processes.

In Chapter 3, the importance of experience is described in the general context of the new “experience economy”, and in the context of the current aviation industry landscape. A theoretical formulation of the four factors that influence passenger experience is constructed (time, service, environment and artefact). The impact of these factors of on the passenger experience is explored through a review of existing works in a variety of fields, including psychology, philosophy, anthropology, sociology, cognitive science, computer science and aviation. A theoretical model of passenger experience is presented drawing on these theoretical foundations. The conceptual model forms the base for the field study components of this research.

The approach used in this research is described in Chapter 4. A comparison of potential data collection methods for the qualitative component of the research is presented. A detailed plan for the delivery of the research outcomes concludes the chapter.

Chapter 5 describes field study one. This field study focuses on the exploration of the factors that influence the passenger experience, and the establishment of the
relative importance of these factors. The method for data collection, participant recruitment process and the interview structure are outlined. The coding process is described, and the results are presented. Analysis of the coded data reveals that time is the primary factor of influence in the passenger experience. Key themes are discussed relating to the way that passengers think of their airport time. These themes indicate that passengers harbour a main concern (‘Will I make my flight?’) and use time as a way to compensate for unfamiliarity and unpredictability in the airport environment.

Field study two is presented in Chapter 6. Field study two aims to examine the nature of the relationship between passengers and their airport time in more depth, and define the modes of passenger engagement in the airport terminal. The method for data collection and participant recruitment are outlined, as is the structure of the in-depth interviews conducted. The coding scheme is introduced and applied to the interview data from field study two. The same coding scheme is applied to the interview data from field study one, allowing the results from field study two to be triangulated against an independent data set. The outcomes of field study two are discussed, in particular the significance of the relationship between time sensitivity and passenger engagement. Four emerging modes of passenger engagement are defined: Airport Enthusiast, Time Filler, Efficiency Lover and Efficient Enthusiast.

In Chapter 7 the outcomes of the two field studies are used to validate and extend the conceptual model defined in Chapter 3. The extended conceptual model clearly articulates the relationships between the factors of influence and the distinct types of passenger experience (staged, prior, expected, perceived and public). The model serves as a framework for understanding the behaviour of passengers in the airport terminal environment.

Chapter 8 presents the outcomes of this research as a set of six principles of experience design for terminal buildings. The principles provide guidelines for the optimal allocation of space in a terminal building, from a passenger experience perspective. The principles highlight the trade off between time sensitivity and
passenger engagement, and demonstrate that in the future, terminal design should target efficient processing rather than retail expansion. The chapter concludes with strategies for the increase of returns on passenger terminal footprint invested.

The final chapter of this thesis, Chapter 9, summarises the research findings, and shows how, through the application of a systematic and rigorous methodology, this research contributed towards existing knowledge about passenger experience in the airport environment. Opportunities for future research are identified.

1.6 Summary
Airports are complex environments comprised of interconnecting systems of people, baggage, cargo and aircraft flows (de Neufville & Odoni, 2003; Kazda & Caves, 2007). Since the 1970’s, the industry has undergone significant changes that have culminated in the proliferation and accessibility of air-travel to a significant portion of the world’s population (IATA, 2012). The growth in passenger traffic, and indeed the projected growth over the next two decades, has placed the industry at an interesting point of innovation inflection.

Looking at the passenger subsystem of aviation, it has been recognised that current approaches to terminal design are unsustainable (Jager & Ofner, 2012). The necessity of reducing operational, construction, staffing and environmental costs is emerging as the key driver for exploring new approaches to passenger terminal design. There is a strong need to change the trajectory of terminal design based on existing paradigms founded on Level of Service metrics (IATA, 2004).

Through a systematic approach, this research aimed to address the challenges in terminal design by looking at the problem from a passenger oriented perspective. The proposed research approach targeted the integration of theoretical knowledge about terminal design and passenger experience with results from qualitative data research and insights obtained from interviews with experts and site visits to international terminals. It is intended that the outcomes of this research can be directly applied towards the development of a tool to assist airport planners and designers optimise the allocation of terminal footprint from a passenger experience
perspective. The following chapter begins with an exploration of existing challenges in terminal design.
Chapter 2. Challenges in Terminal Design

This chapter begins with an overview of the changes that have taken place in the aviation industry over the last six decades. The effects of these changes, and of the general economic shift towards an “experience economy” (Pine & Gilmore, 2011) have impact the way that terminal buildings are designed. The existing approaches to terminal design are discussed, uncovering a paradox that is hidden in the Level of Service (LOS) metrics that underpin existing design approaches in aviation (IATA, 2004). The discovery of the misalignment between operational and passenger centric perspectives of experience presents a key challenge in the design of terminals for true passenger needs.

2.1 Changes in aviation

...much of the glamour and innocent excitement of air travel has been lost in the march toward lower fares and greater security... (Rust, 2007, p. 21)

In the century following the Wright brothers’ inaugural flight of 1903, air travel has undergone a series of significant changes. Some of these changes have been spurred on by advances in technology, others the effects of government intervention and some have arisen as the consequence of free markets and economic competition (de Neufville & Odoni, 2003; Rigas, 2006; Rust, 2007). Collectively, these changes have had significant and fascinating effects on the air-travelling population’s notion of the “passenger experience”.

In recent years, the competition in the airline industry has made air-travel accessible to a significant portion of the world’s population. Since the emergence of SouthWest airlines in the early 1970’s (Barrett, 2004), the skies have been opened to the “middle classes”. In 1971, an airfare of $204 (approximately $1000 in 2010) made it feasible for an American student to vacation in Europe (Friedman, 2010; U.S Centennial of Flight Commission, 2011). It has been estimated that since then, the decreased fares provided by “low cost carriers” like SouthWest airlines have
saved the public billions of dollars (Windle & Dresner, 1999) and made “air” a viable travel option in most developed countries.

The success of low cost carriers is hinged on their innovative and efficient business models. While traditional airlines have operated under complex, long term arrangements with airport operators, low cost carriers have taken a more flexible approach focussed on reducing the dollar per passenger mile (Gillen & Morrison, 2003). They have been able to do this through a combination of (i) using secondary (less expensive) airports, (ii) using a standardised fleet of aircraft (thus benefiting from economies of scale in operation and maintenance), (iii) entering into flexible lease arrangements with airport operators, (iv) utilising the internet as a sales channel, and (v) providing a “no-frills” level of service to their customers (e.g. charging extra for meals during a flight) (Barrett, 2004; Bel, 2009; Chiou & Chen, 2010; de Neufville & Odoni, 2003; Dresner, et al., 1996; Forsyth, 2003; Fourie & Lubbe, 2006; Francis, Fidato, & Humphreys, 2003; Franke, 2004; Gillen & Lall, 2004; Gillen & Morrison, 2003; O’Connell & Williams, 2005; Rigas, 2006; Thanasupsin, Chaichana, & Pliankarom, 2010; Windle & Dresner, 1999).

Through the elimination of services normally provided by traditional airlines (such as in-flight dining, seat assignment, airline lounges), low cost carriers have created a marketplace of largely undifferentiated “no-frills” offerings. For the most part, there is little difference between the economy (coach) services offered by competing carriers. In economic terms, a market in which there is almost no differentiation between offerings, regardless of supplier, is said to be “commoditized” (Marx, 2007; Pine & Gilmore, 2011). In such a market, it is natural for consumers to make their choices based on price (Marx, 2007). This observation is supported by recent studies of low cost carriers (Chiou & Chen, 2010; Fourie & Lubbe, 2006; O’Connell & Williams, 2005; Windle & Dresner, 1999), which demonstrate that consumers are showing increasing “loyalty to the lowest price” (Gillen & Morrison, 2003).

Thanks to the proliferation of the internet and resulting “price transparency” in the industry (RITA, 2012a), a potential passenger can determine the lowest airfare
between two points instantly with a quick Google search (Google Inc., 2012). Although customers love a sale, businesses perish from the practice of competing on the basis of price (Pine & Gilmore, 2011). Pine and Gilmore argue that the provision of commodities alone is not sufficient for the generation of profits in the era of the “experience economy”. This is reflected in the aviation industry, which has struggled for decades with notoriously slim profit margins (Gillen & Lall, 2004; Rigas, 2006).

According to Pine and Gilmore (2011), society has entered a new age in which experiences constitute a new economic offering. They argue that in order to succeed, companies must transition their focus from the provision of goods and services, to the provision of memorable experiences:

_In a world saturated with largely undifferentiated goods and services the greatest opportunity for value creation resides in staging experiences... (Pine & Gilmore, 2011, p. ix)_

Unfortunately, the net effects of the changes in aviation, coupled with the economic shifts in value, have resulted in the commoditization of air travel. This has placed the aviation industry in the economically undesirable position of trading goods and services, rather than higher value experience offerings (Pine & Gilmore, 2011).

According to Pine and Gilmore, the process by which value is added as commodities are converted into memorable experiences is described as “progression of economic value”. Each step-up in the economic progression increases the price and differentiation of the offering. Conversely, each step down decreases the price and differentiation, thus decreasing the opportunity for value creation and profitability. This concept is illustrated with a comparative example between coffee beans and air travel.

Coffee beans start out as a commodity (their price is low, and there is little differentiation between raw beans). Through roasting, grinding and packaging the commodity is turned into a good (price increases, as does differentiation between coffee brands). The packaged coffee, when brewed and served in an ordinary take-
away shop or fast food outlet transforms again into a service (price is increased again and differentiation is embedded in the service provided by the brewer). In the final step, which transforms the coffee into an experience, the largest mark-up is realised – as illustrated by the price one is willing to pay for the experience of drinking a cup of coffee atop the Burj Al Arab in Dubai (here the location provides the differentiation, the price may be multiple times higher than in a take-away store). In aviation, however, the pattern is reversed: what started out as “experience” in the truest form (offered at a comparably high price point), has been transformed into a commodity with little differentiation and a low price point (Friedman, 2010; Gillen & Morrison, 2003; Rigas, 2006; Rust, 2007; U.S Centennial of Flight Commission, 2011; Windle & Dresner, 1999).

Based on the arguments of Pine and Gilmore (2011), it follows that in order to increase profitability in aviation, one should look towards creating “experience” offerings. This concept has been generally recognised and adopted by the aviation industry (Causon, 2011; Mayer, 2012; Peterson, 2011; Wagnert, 2013). However, as the following sections will demonstrate, there is misalignment between these operational goals, and the ability to deliver true “passenger experiences” in airport terminals.

2.2 Current approaches to terminal design

From an architectural perspective, the success or otherwise of an airport building is subjectively evaluated on the basis of its visual qualities. “Success” is traditionally described by terms such as impressive, contemporary, beautiful, architectural masterpiece, cavernous, sparkling, immaculate, or daring (Glancey, 2009; Great Buildings, 2011; Okabe, 1994; Skyscanner, 2010; Toy, 1994). As an example, the new San Francisco Terminal 2 building is considered an “architectural success” (Richards, 2011). The success of the project is attributed to the incorporation of large public artworks, various green initiatives and the treatment of spaces (check-in counters and bathrooms) in a hotel-like manner (Mutzabaugh, 2011; Richards, 2011). The impact of the designed space on the passenger experience is often absent, or mentioned only indirectly, in these traditional evaluations of terminal building success (Andreu, 1997; Pickering & Steinert, 2004).
There are, of course, many airport terminals that passengers themselves consider success stories (SKYTRAX, 2014). The positive impact of the design on the passenger experience, however, is usually attained as a welcome side-effect of a design process that is “guided by intuition” (Palmer, 2006, p. 7) and based on multi-million dollar cases of design “trial and error” (Bricker, 2005; Great Buildings, 2011; Harrison, et al., 2012; SKYTRAX, 2011c). Although airport designers talk of designing for the passenger experience (Mather, 2010; Palmer, 2006; Pickering & Steinert, 2004), what they really mean is an operational interpretation of the passenger experience, rather than a passenger oriented perspective on the same (Harrison, et al., 2012). This disconnect is a natural consequence of the divergent goals of the stakeholders traditionally involved in terminal design (Causon, 2011; de Neufville & Odoni, 2003; Hehir, 2012; Shaw, 2007).

Historically, the design of an airport terminal building has been carried out as a collaboration between the airport owners, the selected architectural firm(s), and occasionally, individual airlines. The airport owners and/or airlines typically develop a set of requirements (brief) for the terminal building project, and a selection of Architectural firms put forth proposals in an effort to win the project bid (Hehir, 2012).

The design has “typically ignored [other] major stakeholders in the airport” (de Neufville & Odoni, 2003, p. 563). Airlines have at times played a more direct role in terminal design, however, this has usually been with a view to maximising the airline’s profitability through the minimization of aircraft ground time (de Neufville & Odoni, 2003; Metropolitan Washington Airports Authority, 2011), and not on creating a more pleasant passenger experience. A notable exception is the traditionally high-yielding passenger subgroup of “frequent flyers”, whose airport experience is directly controlled by the airline through the provision of airline lounges and other specialized services.

Passenger experience, although of interest to passengers, has not been a goal of the stakeholders traditionally involved in terminal design (Figure 2). This includes the direct stakeholders (airport owners, airlines and architectural firms), and the
indirect stakeholders (retailers, government agencies and airport staff) (de Neufville & Odoni, 2003; Hehir, 2012). In fact, a major source of the complexity involved in terminal design stems from the inability to simultaneously satisfy the divergent goals of these stakeholder groups (Gourdin, 1988; Harrison, et al., 2012; Popovic, Kraal, & Kirk, 2010).

The absence of direct passenger involvement in the design process is a consequence of the historical relationship between passengers and airport operators. This relationship has, until recently, been indirect as airport owners have traditionally considered passengers customers of the airlines, not of airports directly (Causon, 2011; de Neufville & Odoni, 2003; Shaw, 2007). As a result, passenger experience has fallen into an “ownership void”. Although airlines have direct influence over their passengers during the initial purchasing and on-plane phases of the overall travel, they have little authority or control over the experience of their passengers in the airport terminal.

In addition to the constraints placed on the terminal design that stem from conflicting stakeholder goals, there are also external forces that can compromise terminal design from a passenger experience perspective. The economic realities of construction often result in trade-offs that need to be made in the design and building phase (de Neufville & Odoni, 2003; Kazda & Caves, 2007). Some of these trade-offs may not be ideal from a passenger experience perspective. As an example, at Atlanta Hartsfield International Airport, the configuration of legacy
buildings and incremental growth resulted in the imposition of inefficient processes on passengers, such as long walk times and seemingly “stupid” policies (Skytrax, 2011a). Operationally, these constraints were unavoidable without undertaking a major re-development project (Mather, 2010; Pickering & Steinert, 2004).

The presence of physical constraints on the building site may also affect the ability to deliver an optimal passenger experience. Although there are various ways to address these constraints, solutions usually require major infrastructure investments to be made. As an example, the lack of space for the expansion of Hong Kong’s old international terminal led to a project involving the reclamation of land to accommodate the new terminal (Lawton, 2002). In the absence of sufficient resources and support from local governments, site conditions can influence the ability to optimize terminal design from a passenger perspective.

Environmental constraints placed on airports constitute a third source of external constraints that may affect the passenger experience. Unlike the budgetary and physical constraints, however, the various “green initiatives” imposed on airport operators need not only lead to environmental benefits such as reduced noise and emissions (Boudreau, Chen, & Huber, 2008; Green, 2003; Saunders & McGovern, 1993). Some of these initiatives, such as the outdoor park area installed at Schiphol in response to environmental mandates, can lead to opportunities for pleasant passenger experiences (de Groof, 2012).

2.2.1 Impacts of industry trends on terminal design

The design of passenger terminals is also affected by two general trends in the aviation industry. The effects of the increased use of technology in passenger processing and the expansion of retail opportunities in terminal facilities on terminal design and passenger experience are discussed below.

Increased technology, automation and self-service

The first trend affecting terminal design is the global move towards automation, self-service and the increased use of technology as a core part of the passenger experience (Copart, 2013b; Port Authority of New York and New Jersey, 2012; SITA, 2012, 2013; Strother, Fazal, & Rettich, 2010). This is evidenced in the airport
environment through initiatives such as remote check-in, self check-in kiosks, self bag drop and automated boarding gates (Copart, 2012; Mayer, 2013; O'Meara, 2013).

The broad goals of the various automation and self-service initiatives are to reduce the amount of time and space required to process each passenger through the terminal (SITA, 2013). The time reduction comes from the anticipation that a self-service kiosk, such as automated check-in, will service passengers faster than the equivalent manual process at a staffed counter. The space reduction is expected to stem from both the smaller footprint of the automated kiosk (a self service kiosk consumes less space than a staffed counter), and also from the faster passenger throughput (the faster passengers are processed, the less space they require in the terminal) (de Neufville & Odoni, 2003; IATA, 2004).

From a passenger perspective, automation and self-service initiatives can radically change the notion of the current passenger experience (Port Authority of New York and New Jersey, 2012). The technology already exists (Harrison, et al., 2014) to make this futuristic vision of travel a reality:

As I enter through the lobby vestibule a light flashes, letting me know that I have been recognized... I see various robot assisted agents... I place my bag on the belt, a light flashes confirming the absence of explosives, another flash recognizes that the bag belongs to me... I walk towards security, a light flashes, recognizing me and notifying the agent that I have been cleared for travel...

(Port Authority of New York and New Jersey, 2012)

The impacts of this trend on the passenger experience are predicted as favourable (Mayer, 2012; SITA, 2012), and were explored in the context of this research.

**Retail expansion**

A second major trend affecting terminal design is the expansion of retail facilities in airport terminals. In general, the expansion of retail is being pursued as a means to increase non-aviation revenue, introduce differentiation between airports and also in response to the perception that passengers want more ambient “shopping and...
dining experiences” at the airport (de Groof, 2012; Griffith-Jones, 2012; Livingstone, Popovic, & Kraal, 2012; Nunes Madeira, 2012).

Related to retail expansion is the creation of larger “airport cities” in and around passenger terminals (Holm, 2012, 2013; Kasarda, 2006; Reinhardt-Lehmann, 2012). According to Holm (2013), the creation of airport cities is the key to solving big urban issues associated with population growth and increased urbanization. The concept of airport cities has been implemented at airports that are well connected to existing cities via public transport infrastructure. For example, Frankfurt Airport attracts many non-travellers to concerts and televised sporting events (Reinhardt-Lehmann, 2012); while Zurich Airport is a common weekend shopping destination for locals due to the extended shopping hours in the airport retail stores (Kolatorski, 2012). From a business perspective, this trend results in an increase in the non-aviation revenue for the airport facility.

From a terminal design perspective, the expansion of retail facilities equates to larger terminal buildings, which in turn equates to an increase in the allotment of space per passenger (ACRP, 2011; IATA, 2004). Underlying this trend is the basic economic assumption that the cost of creating the expanded retail facilities will be less than the revenue generated due to increased passenger spend (Schiller, 1993). At present, there is no clear evidence to support this assumption: the airline industry struggles to maintain profitability amidst increasing operating and infrastructure costs (de Neufville, 2003; Gourdin, 1988; IATA, 2013b; Mazhar, 2013; Newton, 2013; Research for Travel, 2012; The Economist, 2014). The outcomes of this research contributed to the evaluation of the potential returns on the additional retail space invested per passenger.

**Net effect of trends on passenger footprint**

The net effect of automation and retail expansion on the passenger footprint in the terminal has not been discussed in the academic literature or industry conferences. Conceptually, the effects of automation and retail expansion have opposite effects on passenger footprint: while automation reduces the passenger footprint in the terminal building, retail expansion increases the space per passenger (de Neufville...
& Odoni, 2003; IATA, 2004). It is anticipated that the outcomes of this research will reduce the gap in knowledge in this area.

2.3 The paradox of LOS

The Level of Service (LOS) metrics are considered the industry standard for the allocation of space and the evaluation of passenger satisfaction in airport terminal buildings (ACRP, 2011; Correia, et al., 2008b; de Neufville, de Barros, & Belin, 2002; Horonjeff, McKelvey, & Sproule, 2010; IATA, 2004; Yen, et al., 2001). The use of the same metrics for the allocation of space and the evaluation of passenger satisfaction have only recently been identified as potentially problematic (Harrison, et al., 2012). The source of the paradox is explained in this section with the use of two representative examples. The resulting unsuitability of the LOS metrics as a measure of passenger satisfaction is explored in more detail in the following section.

The LOS metrics provide industry benchmarks for the amount of space (square meters) which should be allocated to accommodate each passenger at various processing stages in the airport (IATA, 2004). The amount of space to be allocated per passenger (per process) is derived from the amount of space related to the movement and congregation of passengers on sidewalks (ACRP, 2011; Pushkarev & Zupan, 1975). The total terminal footprint is computed as a function of the space per passenger per process, multiplied by the total number of passengers projected for the design target year (Ashford, Mumayiz, & Wright, 2011; de Neufville & Odoni, 2003; IATA, 2004; Kazda & Caves, 2007). Accordingly, the predicted size of the terminal facility can be expressed as:

According to the LOS metrics, Terminal Size is a function of the TIME and SPACE allocated for each passenger for each PROCESS (check-in, security, customs, boarding, retail), multiplied by TOTAL NUMBER PAX (passengers), or the total projected number of passengers to be accommodated in the terminal building.
The relationship between Terminal Size and TIME, SPACE, PROCESS and TOTAL NUMBER PAX can be represented as shown in Figure 3.

In Figure 3, TIME is the amount of time, and SPACE is the amount of space that is allocated for each passenger for each PROCESS (check-in, security, customs, boarding, retail), and NUMBER_PAX is the total projected number of passengers to be accommodated in the terminal building.

In the LOS metrics, the word “level” refers to one of six pre-determined space and time targets for the planned terminal design (IATA, 2004). The six levels are represented by the range A to F, with A being the best and F being the worst. An extract of the LOS metrics for levels A to F for check-in areas is shown in Table 1. According to the metrics, a terminal design that targets level A will allocate 1.8m² per passenger in the check-in area of the terminal.

From the rightmost three columns in Table 1, it can also be inferred that the said terminal design, by allocating 1.8m² per passenger in the check-in area, will result in “excellent quality and comfort”, “free flow” and “no delays” in the check-in area of the terminal.
The juxtaposition of the metrics for the allocation of space (an objective measure of volume) and quality of passenger services (a subjective measure of perception) creates a paradox in the LOS metrics. Although there is unarguably a minimum amount of space required for humans to function (Hall, 1966), there is no evidence that the more space allowed per passenger, the better the terminal design, or the better the “service” experienced by the passenger (ACRP, 2011). The implied relationship between service quality and provision of space misdirects the prevailing industry view that adherence to the LOS standards results in the provision of a superior service to passengers (ACRP, 2011; Correia, et al., 2008a; de Barros, et al., 2007; Gourdin & Kloppenborg, 1991; O’Connell & Williams, 2005; Yen, et al., 2001; Zidarova & Zografos, 2011).

The paradox of LOS has been partly masked by the overloaded and interchangeable use of the words “service” and “quality” (as summarised in Zidarova & Zografos, 2011) to refer to both objective requirements of space and time, and the subjective evaluation of passenger satisfaction (Harrison, et al., 2012). According to Muller and Gosling:

*The term level of service is commonly used to express the quality of the experience which passengers perceive they encounter in the terminal. (Müller & Gosling, 1991)*
The confusion stemming from the overuse of terminology is further illustrated by the following example from the landmark industry report: ACRP Report 55 (ACRP, 2011). The report finds that:

...to improve passenger perception of the quality of the airport terminal, it is important to minimize passenger wait times. (ACRP, 2011)

The above statement makes a clear link between the subjective interpretation that passengers have of the “quality of the airport terminal” and an objective measure of “passenger wait times”. The report goes on to state:

To improve user perception of the quality of passenger services... need to determine what amenities passengers rely on... (ACRP, 2011)

In this statement, the same word “quality” is now used with reference to amenities relied upon by passengers: a subjectively interpreted element of the passenger experience. The report concludes that:

A primary finding of this research is that larger space by itself does not always generate increased passenger perception of high-quality LOS. Overall perception of quality of service is the result of a combination of factors... (ACRP, 2011)

In the above statement, the word “quality” is first used with reference to the six levels of the LOS metrics. In the second sentence, an implicit link is made between “high quality LOS” and the “overall perceptions of quality of service”. The report appears to contradict itself in linking quality of passenger services to high levels of LOS (“it is important to minimize passenger wait times”) and also stating that this relationship does not necessarily hold true (“that larger space by itself does not always generate increased passenger perception of high-quality LOS”). The apparently conflicting results stem from the use of the same words to represent both the objective measures of space and time (from an operational perspective), and the subjective interpretation of good service (from a passenger perspective).

In addition to the overuse of the words service and quality, the paradox in the LOS metrics is also caused by the lack of separation between objective and subjective perspectives of passenger experience. As an example, consider the following...
extracts from the work of Correia et al. (Correia & Wirasinghe, 2006, 2008; Correia, et al., 2008a, 2008b). Correia acknowledges the importance of designing terminals to meet passenger needs:

*The successfully designed air terminal facility must perform satisfactorily to meet the needs of those who are expected to use it... the maximum accommodation of passenger needs is the chief objective of terminal design. (Correia & Wirasinghe, 2008)*

Correia also acknowledges the need to consider the needs of the passenger from the passenger’s perspective:

*Despite the effort of these agencies, the LOS standards and methods provided by them have been the subject of criticism by airport professionals. One of the main concerns is the lack of passenger input. (Correia, et al., 2008b)*

However, by not differentiating between the perspective of the passenger and that of the airport operator, Correia’s work starts from the closed world assumption (Minker, 1982) that the LOS metrics represent “service quality” to passengers, and proceeds to rate the relative importance of the LOS metrics from a passenger perspective:

...we must consider multiple attributes of level of service and quality... (1) Space available for circulation, (2) number of available seats and (3) waiting time. (Correia & Wirasinghe, 2008)

The work of Correia et al. has made a significant contribution to extending the practical application of the LOS metrics in an operational context (Correia & Wirasinghe, 2006; Correia, et al., 2008a). The pertinent point in the above example, however, is that although the work appears to reflect passenger needs, in actual fact, it represents an interpretation of the relative importance of objective LOS metrics from a passenger perspective.

The lack of separation between objective and subjective perspectives of passenger needs and satisfaction is a recurring theme in the literature in this field. The following section explores this body of work in more detail, discussing why the
existing approaches based on LOS are unsuitable as a measure of passenger satisfaction.

2.3.1 Evaluating LOS as a measure of passenger satisfaction

In this section, the literature on terminal design and service quality is discussed. The discussion focuses on the methods used in the existing literature to evaluate or measure passenger satisfaction.

The work in the area of terminal design and service quality has evolved in response to the developments in the commercial aviation industry (Ashford, et al., 2011; de Neufville & Odoni, 2003). Looking at the work from a historical perspective reflects how the early works founded on basic considerations of LOS space and time have evolved, reflecting changes in technology and passenger expectations (Correia & Wirasinghe, 2008; Fodness & Murray, 2007; IATA, 1995; Lemer, 1988; Mayer, 2013; Transport Canada, 1979).

The discussion in this section illustrates the progression from the development of LOS, through to more sophisticated models and simulation of airport performance, through to the recognition of the passenger voice at an operational level. The discussion is structured on the basis of the conceptual partitioning introduced in the summary paper by Zidarova and Zografos (2011): (i) objective measures of LOS, (ii) subjective measures of LOS and (iii) LOS based on surveys and questionnaires. The major works in each of these categories are evaluated from the perspective of their suitability for the evaluation of passenger experience and satisfaction.

Objective measures of LOS

The modern notion of the passenger terminal began to come on-line after World War II, coinciding with the beginnings of commercial air travel (Ashford, et al., 2011; de Neufville & Odoni, 2003; Gordon, 2008; Kazda & Caves, 2007; Rust, 2007). Correspondingly, the early work in the area of terminal design focussed on developing metrics to compute the size and general spatial allocation inside these terminal facilities (IATA, 1995; Lemer, 1988; Transport Canada, 1979). The space and time metrics that were developed in these early works were collected through manual field measurements and later expanded with the development of
mathematical models (Ashford, Hawkins, O'leary, Bennetts, & McGinity, 1976) and early computer aided simulations (Braaksma, 1973).

The refinement of these models over the last four decades has been partly enabled by advances in technology, and partly through iterative improvements and new knowledge in the field (Brunetta & Jacur, 1999; de Neufville & Odoni, 2003; IATA, 2004; Manataki & Zografos, 2009; Zografos, Andreatta, & Odoni, 2013). The main advances in this area of work have been in the sophistication of the simulation power of these systems. Today, these models are used to predict terminal capacity, effects of delays on terminal congestion and the effects of physical changes in the airport environment on passenger flows and congestion (Brunetta & Jacur, 1999; Chun & Mak, 1999; de Neufville & Odoni, 2003; Fayez, Kaylani, Cope, Rychlik, & Mollaghassemi, 2008; Joustra & Van Dijk, 2001; Parlar & Sharafali, 2008; Richter, Ortmann, & Reiners, 2009; Takakuwa & Oyama, 2003; Tosic, 1992; van Landeghem & Beuselinck, 2002; Wilson, Roe, & So, 2006). At a high-level, the various approaches differ in the specifics of the algorithms that are used in the simulations of various conditions in a terminal building (Zidarova & Zografos, 2011).

The common element in this class of works is that the various simulation approaches rely on objective measures of LOS metrics to be input into the mathematical formulae and algorithms on which the simulations are based (Ashford, et al., 2011; de Neufville, et al., 2002; Horonjeff, et al., 2010; Joustra & Van Dijk, 2001; Manataki & Zografos, 2009; Yen & Teng, 2003; Zografos, et al., 2013). As an example, the work of van Landeghem and Beuselinck (2002) simulated six alternate patterns for passenger boarding. The simulations took as input the number of passengers to be enplaned and the configuration of seats on the plane. The authors acknowledged that the mathematically optimal pattern for passenger boarding, based on an individual boarding sequence, would be unsuitable from a passenger oriented perspective (as it would not allow those travelling together to board together).

The example above highlights that although of operational value, the works based on modelling airport performance on the basis of objective LOS metrics do not
adequately represent the subjective passenger needs or satisfaction from a human perspective. The next section looks at an extension of this category of work: simulation models that take a richer set of input parameters.

**Subjective measures of LOS**

The second category of work in passenger experience and terminal design extends the literature on objective measures by recognising that quality of service is related to perceptions of service. This class of research includes models and simulation of terminal performance based on both objective LOS metrics and subjectively derived input variables (Zidarova & Zografos, 2011).

In general, the work in this area starts with a set of objective LOS metrics, such as passenger wait time in the check-in area or security, or perceived space in the boarding gate area, and augments the objective metrics with an evaluation based on passenger perceptions (Ashford, 1988; Bandeira, Correia, & Wirasinghe, 2007; Correia, et al., 2008a; Fodness & Murray, 2007; Martel & Seneviratne, 1990; Müller & Gosling, 1991; Mumayiz & Ashford, 1986; Rhoades, Waguespack Jr, & Young, 2000; Seneviratne & Martel, 1991; Yeh & Kuo, 2003).

The work of Müller and Gosling represent one of the early studies that used passenger surveys to evaluate perceptions of wait times and crowding in the check-in area of San Francisco International Airport (Müller & Gosling, 1991). The results were quantified into a model that estimated the effects of wait time and crowding on passenger perceptions of service quality.

Correia et al. extended this approach by developing an overall index of airport service quality based on a more extensive set of input variables (Correia & Wirasinghe, 2006; Correia, et al., 2008a, 2008b). Like the earlier work by Müller and Gosling, Correia et al. conducted passenger surveys to assess the importance of the input variables, and amassed these into a unified model for terminal simulation. The variables considered included distances walked by passengers, wayfinding and orientation, and the total dwell time in the terminal (Correia, et al., 2008a). The variables considered by Correia originated from operational LOS metrics (Correia & Wirasinghe, 2008).
The work of Yen et al. explicitly compared passenger perceptions of wait times with objectively measured wait times (Yen, et al., 2001). Passengers were surveyed regarding their perceived wait times in check-in areas and baggage claim. The passenger responses were compared to video footage, revealing that passenger perceptions of elapsed time overestimated actual elapsed time. Similar studies were conducted comparing passenger perceptions of density with actual density (Yen & Teng, 2003) and perceived wait times with actual wait times in check-in, baggage claim and security (Ashford, 1988; Mumayiz & Ashford, 1986).

The relationship between the quality of service provided by airport staff, such as during check-in, and the perceptions of time and space by passengers is alluded to in the work of Yeh and Kuo (2003). The results, however, are not used to evaluate passenger satisfaction, but rather integrated into a mathematical model to compare the quality of passenger services in a given airport over time.

From a passenger centric perspective, the key contributions from this class of work lie in the identification of the discrepancy between objective and subjective interpretations of test variables (such as time and space). Although these observations are made, they are not correlated to their impact on the passenger experience. Rather, the research outcomes make the case for using objectively acquired values rather than subjectively acquired values as input variables in simulation and modelling of terminal performance, by virtue of them being more operationally accurate (Yeh & Kuo, 2003; Yen & Teng, 2003; Yen, et al., 2001).

An exception to the above mentioned body of literature is the work by Fodness and Murray (2007). In this work, the researchers began their investigation with a qualitative assessment of factors that may influence the passenger experience through in-depth interviews, focus groups and content analysis of verbatim comments. The authors note their departure from the LOS metrics as a starting point in the research:
These studies were designed to develop rather than to test hypotheses because the airport quality management and passenger satisfaction literatures lack established theory suggesting formal relationships among the variables of interest. (Fodness & Murray, 2007)

The themes identified by the first phase of their research were used to generate a conceptual model for airport service quality. The model was used as the foundation for a survey of 700 frequent flyers. The focus of the work was on extending service quality theory (Parasuraman, Zeithaml, & Berry, 1988) and providing recommendations for the measurement of the same in an airport context (Fodness & Murray, 2007). Due to the departure from using the LOS metrics as the starting point for the investigation, the work of Fodness and Murray (2007) represents one of the first examples of a truly passenger oriented perspective on factors that influence, in this case, service quality.

Surveys and questionnaires

The third category of work is related to quality of service and passenger satisfaction evaluation through surveys and questionnaires (Airports Council International, 2011; JD Power, 2011; SKYTRAX, 2011c). The main difference between the literature in this category and that described in the previous section lie in the scale of the surveys administered, the context in which the data are collected and also in the way that the results are used in relation to terminal quality assessment.

The surveys conducted by ASQ (2011), SKYTRAX (2011c) and JD Power (2011) are administered annually across large sample sets collectively covering much of the global passenger market. For example, SKYTRAX surveys millions of passengers and over 655 airports each year (SKYTRAX, 2011c), while the ASQ survey reaches over 200,000 passengers and 100 airports annually (Airports Council International, 2011). The JD Power survey is the smallest, targeting only the North American markets (JD Power, 2011).

The questions asked in the surveys are similar to those used in the previous category of work. Passengers are asked to rate, on a five point scale, a range of 16 variables related to check-in times, passport control, crowding and cleanliness. There is also a provision for passengers to leave free text comments (Airports...
Council International, 2011; JD Power, 2011; SKYTRAX, 2011c). Unlike the previous category, however, these surveys are not administered in the airport terminal facility but completed by passengers on-line, at a time of their choosing. As a result, the responses collected from passengers are generally less accurate reflections of their actual experience due to inaccuracies introduced through the reliance on memory and recall (Csikszentmihalyi & LeFevre, 1989; Mori, 2008; Norman, 2009).

In addition to inaccuracies introduced through passengers having to recall their experiences in the terminal after the events have taken place, care must be taken in interpreting the actual data that is collected through these surveys. As an example, although Hartsfield-Jackson International Airport (ATL) is rated as a 3-star airport by SKYTRAX (2011c), 62% of respondents make very negative comments about the arrivals process (2011b). The discrepancy between the words that passengers use to describe their experiences, and the more quantified “star” ratings suggest that the results of these surveys may not provide a true reflection of the factors that affect passenger satisfaction and experience in the terminal building.

The other point of departure between the work in this and the previous two categories is the manner in which the collected data is used. In general, the information collected by these surveys is used for airport marketing and operational analysis, the findings are not directly utilised in terminal design and operations (Causon, 2011; de Neufville & Odoni, 2003; Hehir, 2012; Shaw, 2007; Zidarova & Zografos, 2011).

2.4 Examining the obstacles to designing for passenger experience

In the previous two sections, the evolution of terminal design and associated research were explored. The discussion showed that, from a historical perspective, much of the theoretical research in the field is based on objective considerations of space and time viewed from an airport operations perspective (ACRP, 2011; de Neufville & Odoni, 2003; IATA, 2004). With the growing reach of commercial air travel, advances in technology and a shift in status of the passenger as a profit affecting stakeholder (Carroll, 2012; IATA Corporate Communications, 2011; Mayer,
The issue of designing terminals to enhance passenger satisfaction and experience have been recognised as important from both academic and industry perspectives (Harrison, et al., 2012; Wagnert, 2013). At present, however, there is a prevailing misperception that existing approaches to terminal design accurately reflect passenger needs and desires (ACRP, 2011; Correia, et al., 2008a; de Barros, et al., 2007; Gourdin & Kloppenborg, 1991; O’Connell & Williams, 2005; Yen, et al., 2001; Zidarova & Zografos, 2011). This misperception is perpetuated by the paradox uncovered in the LOS metrics on which existing approaches to terminal design are based (Harrison, et al., 2012).

As discussed in the previous section, there has been very little work to date that has been representative of capturing the needs of the passenger, from their perspective (Fodness & Murray, 2007; Harrison, et al., 2012; Popovic, et al., 2010). Accordingly, although operationally and architecturally, it appears that terminals are being designed to meet passenger needs, at best, they are being designed to meet an operational interpretation of these needs. The strong coupling between business processes and the resulting architecture in a terminal building is illustrated with the following example from Zurich International Airport (Kolatorski, 2012).

**Example: Design based on business processes**

In response to Switzerland joining the Schengen countries in 2009 (European Commission, 2008), Zurich International Airport underwent a major expansion and refurbishment project (Kolatorski, 2012). A key focus of the project was to make accommodations for the processing of Schengen and non-Schengen passengers. Passengers arriving in Zurich may have begun their trip in either a Schengen or a non-Schengen country. On deplaning at Zurich International Airport, passengers could be terminating in Zurich (Schengen), or transiting to another airport (either Schengen or a non-Schengen). Of the transit passengers, those travelling to a “One Stop Security” (OSS) destination would not require the in-transit security check (IATA, 2013a).
The logistics of the business processes associated with these passenger visa and security scenarios was articulated as a set of five passenger processing cases (Kolatorski, 2012): (i) Schengen to Schengen; (ii) Schengen to non-Schengen; (iii) Non-Schengen to Schengen; (iv) Non-Schengen to non-Schengen (OSS); (v) Non-Schengen to non-Schengen (non-OSS).

The five passenger processing cases were translated directly into an architectural design brief, and resulted in the construction of specialized stairwells linking each skybridge to the terminal building. The stairwells were designed to precisely mirror the five possible passenger scenarios through the (manually operated) opening and closing of doors (Figure 4).

Figure 4: The physical design of Pier B at Zurich International Airport is a direct reflection of the underlying logic associated with processing Schengen and non-Schengen passengers.

Source: “Reconstruction of Pier B at Zurich Airport”, used with permission from P. Kolatorski, 2012.

Figure 4 illustrates that elements of terminal design are in practice sometimes approached from a business and operations. In the case of the Zurich stairwells, the elaborate and expensive solution implemented can be easily compromised: the routing of passengers depends on the manual opening and closing of doors to
reflect each of the five scenarios. The opening and closing of these doors is done by airport workers in the course of their busy workday, often resulting in the wrong pathway (and therefore security levels) being opened (Verbal communication, 2012).

In contrast, the following example from Kansai International Terminal illustrates how economic pressures to innovate forced a non-traditional approach to be used in the construction of a new terminal at Kansai International Airport (Goto, 2013a, 2013b). The results of the unorthodox design approach resulted in new market opportunities being uncovered in Japan (Nakamoto, 2012).

**Example: Understanding needs leads to discovery of new opportunities**

In 1995, Kansai International Airport offered passengers the choice of over 30 domestic routes. By 2010, however, that number had fallen to just 9 routes. The retreat of two major airlines, Japan Airlines and All Nippon Airways, from the domestic market resulted in several operational challenges for Kansai International Airport (Goto, 2013a; Yamauchi & Ito, 1995). Firstly, the decline in domestic services was impacting international travellers who used Kansai International Airport as a transfer point. Additionally, the fall in domestic routes and associated passenger traffic left a noticeable impact on overall airport revenue (Goto, 2013a, 2013b).

Through economic necessity, Kansai International Airport was forced to examine solutions to the decaying domestic air travel market (Goto, 2013a, 2013b; Yamauchi & Ito, 1995). Traditional problem solving techniques, although resulting in a range of possible solutions, were not leading to a clear way forward for the airport. Amongst the ideas on the table were the purchasing of a new airline and talk of entering the low cost carrier (LCC) market (Goto, 2013a, 2013b). At this time, low cost carriers had emerged in the USA and Europe, but in Japan, this market was non-existent (Dresner, et al., 1996; Francis, et al., 2003; Gillen & Lall, 2004; Goto, 2013a; Windle & Dresner, 1999; Yamauchi & Ito, 1995).

In 2010, Kansai International Airport commissioned a LCC feasibility study (Yamaguchi, 2013). On the basis of the investigations, the management team made
a bold move to create Japan’s first LCC terminal for a passenger segment that did not yet exist in Japan (Goto, 2013a). The team at Kansai International Airport designed the new LCC terminal using the characteristics of similar target markets from the UK and Europe (Civil Aviation Authority, 2006; Goto, 2013b).

The LCC terminal design was targeted to mirror the “cute and cool” image of Peach Aviation and keep construction costs and time as low as possible (Goto, 2013a; Nakamoto, 2012). In the end, the terminal was erected in an unheard of time frame (6 months design, 11 months construction), at the lowest price per square meter of any terminal in Japan (Goto, 2013a).

The example of the Peach Project at Kansai International Airport illustrates the benefits that can occur when design begins with a true understanding of the target customer’s needs (Brown, 2008; Gallo, 2010; Rowe, 1991). The successful design and conception of the LCC terminal at Kansai International Airport allowed the Japanese people to discover a new experience in domestic travel (Nakamoto, 2012). It opened air travel to an entirely new Japanese market: the cost conscious passenger who formerly did not travel by plane (Goto, 2013a).

2.5 Summary
In this chapter, current terminal design challenges were discussed in the context of the changes in aviation and the general economic shift towards the “experience economy” (de Neufville & Odoni, 2003; Pine & Gilmore, 2011; Rigas, 2006; Rust, 2007). The process of terminal design and importance of designing with an understanding of passenger needs was discussed (Harrison, et al., 2012).

The existing approaches to terminal design, based on the Level of Service (LOS) metrics were examined (ACRP, 2011; IATA, 2004). It was discovered that the LOS metrics represent not only objective measures of space and time required by passengers in the terminal building, but are also a pseudo measure of passenger satisfaction. The juxtaposition of the objective and subjective perspectives of passenger experience represented in the LOS metrics was identified as a paradox (Harrison, et al., 2012).
The paradox of LOS underlies a key challenge in terminal design today. As the needs of the passengers have become more sophisticated (Causon, 2011; Mayer, 2012; Peterson, 2011; Wagnert, 2013), the traditional approaches to design that use LOS as the basis for the evaluation of passenger satisfaction and experience are becoming less adequate (Fodness & Murray, 2007; Harrison, et al., 2012; Kirk, Popovic, Kraal, & Livingstone, 2012; Yen & Teng, 2003; Yen, et al., 2001).

As the economic benefits of designing terminals for optimal passenger experience become generally accepted in the aviation industry (Causon, 2011; Mayer, 2012; Peterson, 2011; Pine & Gilmore, 2011; Wagnert, 2013), the inclusion of passenger experience factors in the design process will become more important. The next chapter discusses passenger experience, deconstructing it into key factors of influence.
Chapter 3. Deconstructing Passenger Experience

The importance of experience is described in the general context of the new “experience economy” (Pine & Gilmore, 2011), and in the context of the current aviation industry landscape. A theoretical formulation of the factors that influence passenger experience is proposed. The impact of the four factors (time, service, environment and artefact) on the passenger experience is explored through a review of existing works in a variety of fields, including psychology, philosophy, anthropology, sociology, cognitive science, computer science design and aviation. A model of passenger experience is presented drawing on these foundations. The conceptual model forms the base for the field study components of this research.

3.1 Human Experience

The human experience is intrinsically linked to the condition of being human (Arendt, 2013; Varela, 1993). This broad, philosophical question of “what it means to be human” has been explored for thousands of years, and continues to be re-explored today (Archer, 2000; Kinnane, 2008; Shakespeare, 1906).

In the writings of the French phenomenological philosopher, Merleau-Ponty (cited in Varela, 1993), the human condition was established as being composed of two separate, yet mutually interconnected, perspectives: the experience of the body and of the mind. Varela continued the works of Merleau-Ponty, deepening understanding along these two perspectives by integrating knowledge from cognitive science and Buddhist meditative psychology (Varela, 1993). Varela argued that human experience, composed of cognition and consciousness, cannot be separated from the context in which it arises. He characterised experience as a dialogue between the body and the physical world (Varela, 1993).

Arendt (2013) extended Varela’s (1993) description of the human condition by looking at experience from the broad phenomenological perspective of labour (biological perspective of man as an animal), and decomposing Varela’s concept of the physical
world into work (artificial world of objects created by man) and action (interactions between humans):

*Only the experience of sharing a common human world with others who look at it from different perspectives can enable us to see reality in the round and to develop a shared common sense. Without it, we are each driven back to our own subjective experience, in which only your feelings, wants and desires have reality. (Introduction by M. Canovan in Arendt, 2013, p. xiii)*

The introductory passage by Canovan (cited in Arendt, 2013) reflects the innate curiosity and need of man to explore and understand the big-picture of the human experience: “enable us to see reality in the round and to develop a shared common sense”. The passage also introduces the notions that human experience is subjective (“our own subjective experience”) and influenced by interactions with others (“experience of sharing a common human world”). Like Varela, Arendt considered the context in which the experience takes place (“provide a stable setting”) as being an influential factor in experience (Arendt, 2013; Varela, 1993).

The subjectivity of human experience has been explored widely in the literature. The work of psychologist and anthropologist Csikszentmihalyi examined human experience on the scale of “labor and actions” (Arendt, 2013), and how these contribute to feelings of personal happiness (Csikszentmihalyi, 1991; Csikszentmihalyi & LeFevre, 1989). Csikszentmihalyi introduced the notion of “flow” and argued that flow is necessary for the creation of optimal experience (Geirland, 1996):

*Flow is a state of concentration so focused that it amounts to absolute absorption in an activity...during which temporal concerns, such as time, food and ego are typically ignored. (Csikszentmihalyi, 1991)*

In his research, Csikszentmihalyi found that for experience to be evaluated as optimal, the experience must present as being challenging yet attainable, interesting enough to require concentration and give the person the sense that they are in control (Csikszentmihalyi, 1991; Csikszentmihalyi & LeFevre, 1989). He found that experience was influenced by the broad context in which it took place: the place, time and interaction with others. The same factors were identified as influential by Arendt and Varela (Arendt, 2013; Csikszentmihalyi, 1991; Varela, 1993).
The collection of works edited by Schifferstein and Hekkert (2011) evaluate product experience within a framework analogous to that used by Arendt. Like Arendt, Schifferstein and Hekkert consider product experience as being influenced by human (labor), product (work), and interaction (action) factors (Arendt, 2013; Schifferstein & Hekkert, 2011). They also acknowledge the subjective nature of experience, identifying that no two people have the same experience with the same product due to the differences in the feelings and emotions that are elicited when a product is used by a particular person in a particular context (Schifferstein & Hekkert, 2011).

The relationships between experience and the context in which they take place was studied by the anthropologist Hall (Hall, 1959, 1966). Like Arendt (2013) and Varela (1993), Hall recognised that experience is influenced by the environment in which it takes place. He introduced the concept of “proxemics” to describe the differences in how context is experienced by people of vastly different cultures such as the Navajo Indians, Anglo-Saxons and people of Middle-Eastern descent (Hall, 1959, 1966). Hall also acknowledged that experience is moderated by interactions between people and “extensions” of their organism (what may be more commonly thought of as products or tools) (Schifferstein & Hekkert, 2011).

From a business and marketing perspective, Pine and Gilmore (1999) treat experiences as external entities which are consumed by the paying customer:

An experience occurs when a company intentionally uses services as the stage, and goods as props, to engage individual consumers in a way that creates a memorable event. (Pine & Gilmore, 2011, p. 98).

Pine and Gilmore (1999) make explicit the temporal element of experience considered by Csikszentmihalyi and LeFevre (1989). They treat experience as the cumulative effect of the interaction between the provider of the experience (“a company”) and the consumer over time (“creates a memorable event”) and assign a value to the effects that “memory creation” plays in the overall evaluation of experience (Pine & Gilmore, 2011).

The temporal quality of experiences has also been examined from the perspective of works on human memory (Mori, 2008; Norman, 2009), showing that the memory of an experience can sometimes be more valuable than the experience itself. Not only does
the passing of time serve to delete the bad parts and amplify the good parts of an experience (Mitchell, Thompson, Peterson, & Cronk, 1997; Mori, 2008); time can actually create fake memories, which are indistinguishable from real memories:

> People sometimes fondly remember events that never happened — and strenuously insist that they did happen, despite the evidence. In one experiment, people recalled seeing Bugs Bunny at Walt Disney World despite the fact that the wily rabbit is not a Disney character (he’s from Warner Brothers Entertainment Inc.) and could not have been there. The study concludes that even knowing a memory is not real does not make it any less meaningful or enjoyable. The memory of an event is more important than the actual experience. (Norman, 2009, p. 27)

The findings of Braun-LaTour et al., in the experiment cited by Norman (“knowing a memory is not real does not make it any less meaningful or enjoyable”), raises the question of how experiences are evaluated. Although the perspectives on what constitutes experience vary slightly in the literature discussed in this section, the works share a commonality in their evaluation of the success of a person’s experience as a subjective measure of personal satisfaction (Arendt, 2013; Csikszentmihalyi, 1991; Norman, 2009; Schifferstein & Hekkert, 2011).

In the context of Csikszentmihalyi’s flow (1991), satisfaction was represented as a measure of happiness, or personal fulfilment. Arendt (2013) considered personal satisfaction a measure of feelings, wants and desires, recognising that there is also a shared quality to experience that stems from the interactions between people. Schifferstein and Hekkert (2011) adopted Russell’s (2003) measure of “core affect”, a combination of pleasure and arousal, to evaluate the psychological effects of the interaction between person and product. In work of Pine and Gilmore (2011), and Norman (2009), satisfaction was articulated as the difference between the customer’s expected and perceived experience.

The discussion on human experience has thus far focussed on the meaning and interpretation of experience from the perspective of a human, interacting with products or services in a given context. In addition to this singular perspective of experience, Arendt (2013), Varela (1993) and Hall (1959) also identified that human experience consists of shared experiences. These shared experiences result from the interaction
between people. In his work on the effect of culture on experience, Hall (1959) identified that our interpersonal experiences are shaped by sub-conscious elements deeply enshrined in the cultural systems in which we are raised.

The literature presented in this section provides a range of perspectives on what constitutes human experience. From the works examined, a number of characteristics emerge as common:

1. Experience is subjective.
2. Experience takes on a different quality when considered from different perspectives such as personal and shared experiences.
3. Experience is influenced by interactions with external factors such as products, people and the context that the interaction takes place in.
4. Experience is evaluated through satisfaction.
5. Experiences are cumulative and gain value with the passage of time.

The definition of passenger experience presented in the following section draws on the above commonalities of human experience.

### 3.2 Passenger Experience

In the previous section, relevant literature was reviewed to present a multi-dimensional perspective on human experience. Extrapolating from the common elements of human experience identified, it can be inferred that airport passenger experience is subjective, measured by satisfaction and is influenced by the context in which it takes place: the place, time, and interactions with others.

In the specific context of experience of passengers in airports, Popovic et al. (2010) have described airport passenger experience as the “activities and interactions that passengers undergo in an airport [terminal building]”. They categorize passenger experience into two broad categories: (i) necessary activities and (ii) discretionary activities. These two categories of activities are illustrated in Figure 5.
The necessary and discretionary activities illustrated in Figure 5 constitute the sequence of processes encountered by passengers during the departures process at many international airports. Necessary activities are those that must be completed by a passenger in a set order: arrival at the airport, check-in, security and customs, boarding (Figure 5). Discretionary activities, on the other hand, are optional and unordered, for example, a passenger may exchange currency and/or have a cup of coffee, or choose to do neither.

Drawing on the existing general research on experience, and the experience of passengers in airports in particular, the following description for passenger experience is extended from that proposed by Harrison et al. (2012):

*Passenger experience can be described as a relationship between passengers and the airport (operators) that is formed over time through a series of activities or interactions between the passenger and the airport. The activities consist of a set of ordered, necessary activities, optionally interspersed with discretionary activities. Each activity represents an interaction between a passenger and/or a service, and/or an artefact, and/or the terminal building. Passenger experience is subjective, and measured by satisfaction: the difference between expectations and perceptions.*

(Harrison, et al., 2012)

In the next sections, each of the four factors identified in the proposed definition of passenger experience: (i) time, (ii) environment, (iii) service and (iv) artefacts, are discussed in detail. These factors are shown in the model in Figure 6.
3.2.1 Time

Pine and Gilmore (2011) allude to a temporal quality which characterises experiences. Elapsed time is necessary in the formation of relationships between the stager of an experience and the customer: experiences are revealed over time, as opposed to services that are consumed in the moment. In a terminal building, the passing of time unveils the set of interactions between passenger, terminal and artefacts which form the passenger experience (Harrison, et al., 2012).

In most contexts, elapsed time is measured in hours, minutes and seconds and is considered objective, i.e. the period of time described as “five minutes” is generally understood to have the same meaning regardless of the task being considered. Objective time, however, takes on a subjective quality when considered from the perspective of an individual engaging in a given experience. Indeed, as noted by Norman (2009), the subjective interpretation of time influences the perception of the event itself: time appears to “fly” when one is having a good time, and conversely “crawl” when one is not (Csikszentmihalyi & LeFevre, 1989; Hale, 1993; Hall, 1983; Norman, 2009).

Conceptually, these different perspectives of time can be represented as shown in Figure 7. The objective perspective of time is the common, clock measured, interpretation of time. The subjective perspective of time, on the other hand, is a
function of the clock time as interpreted by an individual during the course of a particular experience.

\[\text{Figure 7: Objective and subjective perspectives of time}\]

This distinction between objective elapsed time and subjective perceived time is not currently considered in the context of passenger experience or terminal design. Outside of terminal design, however, the subjective nature of time has been examined from numerous perspectives (Csikszentmihalyi & LeFevre, 1989; Hale, 1993; Hall, 1983).

In his intimate dealings with the American Indian people of Arizona, Hall noticed that their fundamental concept of time was significantly different to his own, and that these again differed across other Eastern and Western cultures (Hall, 1983). Hall generalised his observations of time into two broad categories: (i) monochronic time (doing one thing at a time), and (ii) polychronic time (doing many things at once). He also noted that time is perceived differently, based on factors such as (i) the nature of what is being done, (ii) how much the task is enjoyed, (iii) the size of the job at hand, and (iv) the age of the person.

In more recent work, Norman confirms Hall’s observations and explores how perception of time can be changed by manipulating the “nature of what is being done” and the “enjoyment” of the task at hand (Norman, 2009).

The variable nature of time as it relates to experience was also noted by Csikszentmihalyi (1991) who found that a sense of “time standing still” was a factor present when a person engaged in activities which resulted in a high degree of
satisfaction, or “flow” (Csikszentmihalyi, 1991; Csikszentmihalyi & LeFevre, 1989). The quality of timelessness as a necessary ingredient for flow was found to be independent of culture, age and gender.

The work of Hale (1993) formalised the subjective nature of time into a classification framework of nine distinct time “dimensions”:

1. Chronos time: objective clock time.
2. Faustian time: “never enough time” time, usually associated with a Western lifestyle and roughly correlated to Hall’s (1983) concept of polychromatic time.
3. Gaian time: time which transcends any one life, and connects life with past and future lives, can be likened to the concepts of time explored by Hawking (1996).
4. Promethean time: time associated with “timelessness” and complete absorption in creative activity, correlates to Csikszentmihalyi’s (1991) observations of flow.
5. Distracted time: time spent in unproductive activity, generally associated with “wasted time”. Correlates to the time that Norman (2009) argues can be leveraged and exploited to enhance experience.
6. Icarus time: the fleeting moments in time when the peak of Maslow’s hierarchy (1968) are achieved: the ultimate “high” experience in life.
8. Sisyphus time: time associated with despair, or depression. Like Promethean time, Sisyphus time has a timelessness associated with it, but of a negative nature.
9. Atman time: fleeting moment of infinite time, as associated with an epiphany.

Of the nine time dimensions identified by Hale (1993) only “Chronos” is considered objective. The remaining eight classifications describe various characteristics of subjective time. Most notably, it is these subjective dimensions of time that influence experience in general, and passenger experience in particular.

A further classification of time can be made along a “value” dimension. Much of the literature in this space provides economic, and hence, objective perspectives on the
value of time (Becker, 1965; Beesley, 1965; Cesario, 1976; Gronau, 1974). However, like Hale’s observations about the experience of time, the value of time is similarly subjective. In the context of passenger experience, it is currently assumed that the value of time differs between passenger types: in general, it is believed that holiday goers do not value time as much as business travellers (Gillen & Morrison, 2003). The objective measure of this difference in time “value” is reflected in the price of airline tickets – short, direct flights are generally more expensive than longer, less direct flights between the same two points.

Drawing on the literature, it is possible to extrapolate that, in the context of the airport terminal, the factors that influence the passenger experience (Figure 6) are likely to play a role in shaping the passenger’s interpretation of time, i.e. their notion of Time (subjective), as represented in Figure 8.

![Figure 8: Factors that influence subjective (passenger) time in an airport terminal](image)

3.2.2 Environment

The passenger terminal building, complete with its myriad of corridors, shops, check-in, security and customs counters, creates the setting for the passenger experience. It has been argued that the environment in which an experience takes place and the experience itself are so interconnected that they serve to mutually shape each other (Adey, 2008; Ciolfi, Deshpande, & Bannon, 2005; Dewey, 1934). According to Merleau-Ponty:
The world is inseparable from the subject...and the subject from the world (Merleau-Ponty cited in Varela, 1993, p. 4)

The symmetry of influence between context and experience described by Merleau-Ponty in the above passage implies that not only does terminal design shape the passenger experience, but that passenger experience should in fact be shaping the design of passenger terminals. In reality, this is not the case: due to the paradox in the LOS metrics, and the resulting lack of separation between operational and passenger oriented interpretations of experience, the true needs of the passenger are not currently considered in the design of passenger terminals (Chapter 2).

As a physical environment, the terminal building is well understood from an Architectural perspective. The study of proportion and scale, as they relate to space and the human form have been studied in architecture for thousands of years (Aiken, 2002; Ching, 2010; Ching & Eckler, 2012). Accordingly, form and function in the built environment are well understood, and typically form the framework within which architectural projects are evaluated in terms of their success (Chapter 2). The usability of architectural buildings, however, is a topic that is more recently becoming investigated (Lawson, 2006). Aspects of passenger flow and effects of congestion or flight delays are often modelled using simulation systems (Brunetta & Jacur, 1999; Chun & Mak, 1999; Fayez, et al., 2008; Joustra & Van Dijk, 2001; Takakuwa & Oyama, 2003).

The connection between the architectural environment and experience is made by Klingmann (2007). In her research, Klingmann examines how the ethos of a brand can be represented in an architectural form, and conversely, how the architectural landscape itself becomes a “brandscape”. Klingmann’s work provides an extension to the traditional aesthetic-centric view of creating architectural spaces and affirms the connection between environment and experience. The work does not, however, consider the needs of end users of the architectural environments directly, but takes a more externally oriented view of the impacts of brand on architecture (and architecture on brand).

The fundamental lessons about the space that humans require in various situations (intimate, personal, social and public), and the consequences when these space
“bubbles” are violated (Hall, 1966) help to explain the behaviour, and anxiety, of passengers in terminal buildings (Bricker, 2005). Whereas Hall’s work was grounded in the physical, the internet has opened a new dimension in which humans exist, interact and experience (Kaplan & Haenlein, 2010; Markham, 1998; Rheingold, 1991; Steuer, 1992). Of particular note are the effects of technology in the creation of virtual spaces in physical environments, for example, through the simple act of putting on headphones and engaging with a smartphone.

The work of Tuan (2001) provides a philosophical connection between space, place, time and experience. According to Tuan, space and place are connected yet opposing forces of “freedom” versus “security” – one is attached to place yet longs for space. From his philosophical examination of time, Tuan introduces the notion of “mythical space”. Mythical space is described as the virtually constructed spaces that fill the gaps between known facts: for example, although never visited, nor necessarily believed as existing, most people will have a sense of what “heaven” would look like. In the terminal building, Tuan’s concept of mythical space can be mapped to the “status space” that is provided through premium passenger services.

The effects of the environment on passenger experience are present in a large array of evidence ranging from personal accounts, anecdotal evidence, public opinion on social media sites right through to data collected formally by aviation related survey companies like SKYTRAX (2011c) and JD Power (2011). Statements such as “Airport X was so confusing, and we had such a terrible experience there, that we will never fly through that airport again” (Skytrax, 2011a) can be found across the range of sources above. The reluctance of passengers to return to an environment in which they had a bad experience appears to be long lasting. This is explored in more detail in field study one (Chapter 5).

3.2.3 Service

The design of individual services has been actively explored in the literature since the early 1980’s, beginning with the seminal work of Shostack (1982). In this work, Shostack introduced the differences between product and service design: the former being related to objects that can be owned, while the latter refers to experiences which
cannot be owned, but rather participated in. Although seemingly different, Shostack’s work suggested that the two are intrinsically linked. Anecdotally, this is evident in the luxury goods sector, where consumers pay a premium (in part) for the “service” associated with the luxury product. For example, Lexus cars (product) offer their patrons “free” valet parking and car washing when they park at selected airports.

More recently, the work of Norman (2009) examined the link between the provision of good customer service, and a positive customer experience. In this work, Norman shows how the modern customer responds favourably to transparency and information provision. For example, the act of providing the reason for a flight delay (bad weather at the destination) will reduce the anger felt by delayed passengers (as compared to the same delay, but where the reasons are not communicated). This observation is supported by a recent study by the Airport Cooperative Research Council, which found that access to information was considered a key factor in determining the success of a passenger’s journey (ACRP, 2011).

A further property of service perception noted by Norman (2009) is that a person’s memory of a service (or event) may not be accurate, and is often distorted by memories of the beginning and end. This concept is exploited in many contexts, including the layout of “walk through” duty free shops emerging in airport terminals which force the customer to walk through the store, and entice them with offers on their route to the exit (Livingstone, et al., 2012; Murphy, 2013; Nunes Madeira, 2012).

The quality of service encountered during an experience event will also influence a person’s perceptions of the experience itself (Parasuraman, et al., 1988). According to the SERVQUAL model developed by Parasuraman et al, service is evaluated (perceived) along five dimensions: (i) tangibles, (ii) reliability, (iii) responsiveness, (iv) assurance and (v) empathy. Like experience, service quality is evaluated by the subjective gap that exists between customer expectations and perceptions of a service encounter (Grönroos, 1984).

Norman (2009) demonstrated that the gap between perceptions and expectations can be affected through authentic and fair provision of information. Norman found that influence of information transparency was so strong, that it could result in “satisfaction”
even in the face of service breakdown. As an example, Norman cites his experience with a delayed flight: due to the honest and timely provision of information by the crew and the pilot, the passenger’s expectations were managed, resulting in a positive experience despite the cancellation of the flight (Norman, 2009).

The science of managing expectations and influencing perceptions has been the life work of psychologist Cialdini (2001). Cialdini’s research uncovered six principles that influence people: (i) reciprocity, (ii) consistency, (iii) social proof, (iv) authority, (v) likability and (vi) scarcity. These techniques underlie Norman’s findings about information transparency, and can be directly applied towards managing expectations and reducing the satisfaction gap. As an example, the delivery of bad news, such as the delay or cancellation of a flight, is received more positively if the message is delivered in a calm and polite manner, reflecting Cialdini’s principles of likability and authority. This observation was supported by Norman, who witnessed the decline of passenger service perception when the ground staff became confused and stressed, thus losing grip of their authority and likeability (Cialdini, 2001; Norman, 2009).

As entities, services and experiences share a lot of similarities: they are both subjective and evaluated through satisfaction, they differ from person to person and are influenced by external factors. The key point of difference between services and experiences is that they differ in their temporal qualities. Services are consumed and evaluated at the time of the service event (Ladhari, 2009; Parasuraman, et al., 1988), whereas experiences gain value with the passage of time (Norman, 2009; Pine & Gilmore, 2011). A further distinguishing feature between services and experiences is the scale on which they are enjoyed: services tend to be evaluated as interactions between the customer and the service provider (Ladhari, 2009), while experiences also have a collective quality about them (Arendt, 2013; Pine & Gilmore, 2011; Varela, 1993).

As yet, the link between service design and experience design is a relatively unexplored area of research. However, as businesses get more entrenched in the “experience economy” and target the delivery of experiences over services (Jager & Ofner, 2012; Pine & Gilmore, 2011), it is natural that the development of models for experience design will emerge. The work of Stickdorn et al. (2011) begins to address the transition
from service to experience delivery. In their work, Stickdorn et al. blur the lines between service design and experience delivery by taking an end-to-end approach through their “service design journey mapping”. A key contribution of their work is the recognition that service design needs to be approached from a temporal, holistic perspective in order to create valuable customer “experiences”.

3.2.4 Artefacts

The airport environment is undergoing a major shift towards the wide-spread use of various “self-service” artefacts at, and en-route, to the airport (Jager & Ofner, 2012; Mayer, 2013). The main drivers for the introduction of self-service and mobile initiatives in the passenger terminal are cost: both reduction in current operating costs, and control over the projected, unsustainable costs of servicing the growing numbers of air-travelling passengers (Jager & Ofner, 2012).

The trend towards an increasing presence of artefacts at the airport is being enabled by a number of complimentary developments. The first of these is the advance of common industry standards for the exchange of information. The development of these standards has made it feasible for disparate data sources (for example from various airline reservation systems) to communicate to a single self-service artefact like a check-in kiosk (Behan & Craig, 2012; Copart, 2012). There are still major challenges surrounding interoperability and information exchange, especially as this pertains to data exchange between disparate stakeholders such as airlines and airports (Deacon, 2013; Harrison, et al., 2014). This topic is outside the scope of this research, but is discussed briefly in the context of future work in Chapter 9.

Secondly, the emergence of enabling technologies, such as Bluetooth, RFID (radio-frequency identification) and NFC (near-field communication) are making real-time communication with passengers at the airport a reality and continuing to change the dynamics of the passenger experience (ACRP, 2012; Copart, 2012, 2013a; Fujiyama, 2013; Fukaya, 2012; Mayer, 2012).

The increasing reliance on, and comfort with, technology by passengers is contributing to the favourable uptake of new initiatives by a large segment of the travelling public (Copart, 2013a; de Groof, 2012; Mayer, 2012; Stelling, 2012). Already, almost 40% of
travellers fall into the “Gen Y” (35 years and younger) digital-native category (Joy, 2012; Ramsden, 2013). On the supply side of the equation, it is projected that by 2015 around 90% of airlines will offer mobile check-in facilities, 90% of airlines and 91% of airports will have rolled out apps (SITA, 2013).

The infiltration of technology and related artefacts into the passenger experience forms an integral part of the industry’s vision for “future travel” (Port Authority of New York and New Jersey, 2012). IATA’s concept of the airport of the future is based on information exchange between stakeholders (airlines, airports, government agencies and passengers), and the provision of self-service options (self-bag drop, elimination of check-in, automated border control) (SITA, 2013). The seamless and efficient vision of future travel is heavily reliant on both artefacts and technology, as illustrated below:

*I checked in at home and the airline has remotely activated the microchips that currently exist on my bag tags and mobile device... As I enter through the lobby vestibule a light flashes, letting me know that I have been recognized... I packed an extra bag, I place it on the belt, a light flashes confirming that it recognizes that the bag belongs to me, it is tested for explosives and/or other contraband, and off it goes. All accomplished in a matter of seconds... I proceed through the comfortable space to the security portal. As I enter the walkway a light flashes, once again recognizing my presence... I and my briefcase have been scanned for explosives and contraband while traversing through the walkway and have been cleared to go. (Port Authority of New York and New Jersey, 2012)*

It is evident that the push towards automation and an increased reliance on technology is originating from both the industry (cost cutting) perspective and the passenger (ease of passage) perspective. This trend is being reflected in the introduction of various classes of artefacts into the airport environment (Copart, 2012, 2013b; Fukaya, 2012; Tarbuck, 2012a), including:

1. Self-service kiosks and mobile/web for check-in
2. Self-service baggage drops
3. Self-boarding gates
4. Kiosks for re-booking missed flights
5. Smart phone apps for wayfinding; status updates; sales incentives; customer feedback
The impacts of the introduction of these artefacts into the passenger terminal environment have been reported as favourable (de Groof, 2012; Mayer, 2012; Stelling, 2012), although at present, the full effects on the passenger experience, airport profitability and terminal design are unknown. What has been recognised is the need to measure the impact of the various new technologies in the airport environment (Ramsden, 2013). Developing the right tools and methods to achieve this remains an open problem.

Although the impact of artefacts on the overall passenger experience is considered in this work, the experience between the passenger and the artefact at the product level is outside the scope of this research (Gomez, Popovic, & Blackler, 2012; Lawson, 2006; Norman, 2002; Schifferstein & Hekkert, 2011).

3.3 Importance of passenger experience

In the words of Pine and Gilmore (2011), society has entered the age of the “Experience Economy”. This emerging era is characterised by a new economic offering, namely experiences. Table 2 summarises the key characteristics of the experience economy, and shows how these have changed in the transition from the extraction of commodities, through to creation of goods, provision of services, and finally the staging of experiences. Of particular note are the contrasts between the nature of the offering and the method of supply.

The nature of an experience offering differs from services in an important way. Whereas the value of services is realised at the time the service is delivered, the value of experiences lasts past the point of delivery of the experience itself. As an example, consider a family holiday. The experience of the holiday “gives back” to the family long after the holiday event is finished through the generation of shared memories (Oh, Fiore, & Jeoung, 2007; Pine & Gilmore, 2011). The notion that the memory of an experience can continue to generate value for the experience provider after the experience has finished can be inferred from the work of Pine and Gilmore, and is supported by independent research (Norman, 2009).
Table 2: Comparison of characteristics of economic offerings across the four economic eras
Adapted from “The experience economy” by B. Pine and J. Gilmore, 2011, p. 9.

<table>
<thead>
<tr>
<th>Economic Offering</th>
<th>Commodity</th>
<th>Goods</th>
<th>Services</th>
<th>Experiences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agrarian</td>
<td>Industrial</td>
<td>Service</td>
<td>Experience</td>
<td></td>
</tr>
<tr>
<td>Extract</td>
<td>Make</td>
<td>Deliver</td>
<td>Stage</td>
<td></td>
</tr>
<tr>
<td>Fungible</td>
<td>Tangible</td>
<td>Intangible</td>
<td>Memorable</td>
<td></td>
</tr>
<tr>
<td>Natural</td>
<td>Standardized</td>
<td>Customized</td>
<td>Personal</td>
<td></td>
</tr>
<tr>
<td>Stored in Bulk</td>
<td>Inventoried after production</td>
<td>Delivered on Demand</td>
<td>Revealed over a duration</td>
<td></td>
</tr>
<tr>
<td>Trader</td>
<td>Manufacturer</td>
<td>Provider</td>
<td>Stager</td>
<td></td>
</tr>
<tr>
<td>Market</td>
<td>User</td>
<td>Client</td>
<td>Guest</td>
<td></td>
</tr>
<tr>
<td>Characteristics</td>
<td>Features</td>
<td>Benefits</td>
<td>Sensations</td>
<td></td>
</tr>
<tr>
<td>Raw Coffee Bean</td>
<td>Packaged Beans</td>
<td>Take-Away Coffee</td>
<td>Coffee at top Burj Al Arab</td>
<td></td>
</tr>
</tbody>
</table>

In Chapter 2, it was argued that the flight component of a person’s journey has largely become commoditized, and hence has little scope for price elasticity. The flight, however, constitutes only a portion of the passenger’s overall travel experience (Figure 9). The journey to and from the airport, and the experience within the terminal building (both departures and arrivals) are also elements of the overall trip. Although Gillen and Morrison (2003) do not directly come to this conclusion, their research provides a clue that in a market of undifferentiated product (i.e. air travel) the only places for differentiation (and hence increase in prices) are the airport experience (both departures and arrivals), and possibly the access to/from the airport.

Figure 9: Components of a passenger’s overall travel experience, with the Airport (*) providing the opportunity and setting for differentiation
Hence, the passenger terminal building provides a setting that can be leveraged for reducing the effects of commoditization in the air travel industry. Within this setting, the focus on passenger experience is a natural consequence of the changes in revenue flows in airports post de-regulation, and the proliferation of mobile computing and social networking.

De-regulation in the airline industry and the introduction of low-cost carriers resulted in major shifts in the sources of revenue for airport operators (Causon, 2011; de Neufville, 2008; Kazda & Caves, 2007; Peterson, 2011; Rigas, 2006). Prior to privatisation, airports operated as quasi-government “utilities” (Gillen & Morrison, 2003). Much of the revenue under this model was generated from exclusive use, long-term lease arrangements between airports and carriers. With de-regulation, however, the revenue streams changed, and became much more directly linked to passengers themselves through retail revenue and fees collected from ticket sales (Causon, 2011; Kazda & Caves, 2007; Peterson, 2011).

In unrelated, yet parallel developments, the explosions in mobile computing and social networking have contributed to the power that customers wield in various domains (Air Gate Solutions, 2011a, 2011b; Barlow & Moller, 1996; Barlow & Stewart, 2004; Barnes, 2011; Causon, 2011; Morales, 2011; Norman, 2009). As an example, the now famous story of how “United Breaks Guitars” (Carroll, 2009) heavily influenced public opinion about the airline. Although a precise dollar amount was never agreed upon, there is little doubt that Dave Carroll’s “one voice” made an impact on United Airline’s profit line (Barnes, 2011; Carroll, 2012; Kietzmann, Hermkens, McCarthy, & Silvestre, 2011; Morales, 2011).

The recent change in the role of the passenger from a non-involved party to a profit affecting stakeholder (Chapter 2), explains, in part, why optimising the passenger experience remains an unsolved problem. Historically, the relationship between passengers and airport operators has been indirect, as airport owners have traditionally considered passengers customers of the airlines, not of airports directly (Causon, 2011; de Neufville & Odoni, 2003; Shaw, 2007). As such, the passenger experience has fallen into an ownership void: although airlines have direct influence over their passengers...
during the initial purchasing and on-plane phases of the overall travel, they have little authority or control over the experience of their passengers in the airport terminal (a notable exception is the case of the frequent flyer sub-group).

As a result of the confluence of technology and changes in aviation, passengers have become recognized as major stakeholders who have the power to influence airport profitability. This change in role of the passenger is reflected in the surge in industry conferences focusing on the passenger experience, for example Passenger Terminal Expo, Future Travel Experience and the IATA World Passenger Symposium. Passenger experience, by virtue of its direct link to airport profitability, has become a focal topic of interest in aviation (Deillon, 2013).

3.4 Using passenger experience

The discussion in this chapter has defined passenger experience and described its importance from the perspective of overall airport profitability. Passenger experience ought to be considered in the design of airport terminal buildings, but for reasons outlined in Chapter 2, this is not currently the case. In this section, the discussion turns to examining the ways in which knowledge about the passenger experience could be utilised, assuming the obstacles discussed could be overcome.

Design approaches that begin with an understanding of the needs and desires of the customer have been used in many fields under a variety of different names. In computer science they are referred to as human centred design (Maguire, 2001), in user interface design they are called usability (Nielsen, 1994), the Japanese refer to it as Kansei engineering (Levy, Lee, & Yamanaka, 2007), service designers call it service design thinking (Stickdorn, et al., 2011) and product designers have extended traditional approaches to include the emotional “affective” aspect of product design (Schifferstein & Hekkert, 2011). The premise that is shared by all these approaches is the belief that all “insanely great” solutions should begin with the customer experience, not with the product or technology (Gallo, 2010).

Due to the lack of separation between operational and passenger perspectives of experience, as well as the paradox embedded in the LOS metrics, this step has been compromised in current terminal design approaches (Chapter 2). As a consequence,
although it appears that the design process is based on real passenger needs and wants, it is not. One of the key aims of this research is to extend existing knowledge about the passenger experience, from their perspective.

Assuming that a deeper understanding of the passenger experience can be attained, the question shifts to how this new knowledge can be utilised. In marketing, a common strategy to improve understanding of a customer base is through market segmentation, or the partitioning of the total customer base into homogenous sub-sets (Sarabia, 1996; Shaw, 2007). The process of dividing the total customer base into sub-sets enables the development and design of more focussed, and thus higher value, product and service offerings (Freathy & O’Connell, 2000; Shaw, 2007).

The creation of market segments allows generalisations to be made about the characteristics of each sub-group (Klingmann, 2007; Norman, 2009; Parasuraman, Zeithaml, & Berry, 1985). Sarabia (1996) pointed out the importance of selecting appropriate criteria for segmentation, noting that the criteria used will impact the quality of generalisations that can be made about the target group. For example, although it is possible to segment travellers based on the colour of their luggage, it is unlikely that such a partition will lead to significant insights, or a deeper understanding of what influences the passenger experience in the terminal building.

The selection of criteria on which to segment a population has been described as “a complex ‘art’ type of process” (Wind & Cardozo, 1974). Ideally, the criteria used to create market segments will reflect the core values of the sub-groups created (Gallo, 2010; Harrison, Popovic, & Kraal, 2013; Sarabia, 1996), thereby providing true understanding of the wants, needs and desires of the members of that group.

To date, traditional market segmentation in the airline industry has been based on two basic criteria: (i) purpose of trip (business or holiday), and (ii) frequency of travel (frequent or non-frequent flyer) (Shaw, 2007). In some studies, journey length (short-haul or long-haul) and country or culture of origin have also been considered as segmentation factors (Freathy & O’Connell, 2000; Shaw, 2007).
Recent studies have extended the basic segmentation criteria in the context of airport retail (Freathy & O’Connell, 2000; Geuens, Vantomme, & Brengman, 2004). Passenger typologies have also been indirectly alluded to, for example in the treatment of “business”, “family” and “senior” travellers in the recent “Friend-Lean” vision for future air travel (Altran.com, 2011). A number of studies have informally selected a passenger sub-segment, for example, the transfer passengers examined by de Barros et al (2007), or the frequent flyers surveyed by Odoni and de Neufville (1992), however market segmentation of passengers was not formally discussed in these studies. Gilbert and Wong (2003) noted differences in passenger expectations between the (informally constructed) passenger sub-groups in their research. Their findings suggest that passenger experiences, although highly individual, may be amenable to generalisation or abstraction by passenger type.

Although commonly studied as a sub-group, “business frequent flyers” do not necessarily represent the characteristics of the majority of travelling passengers (Fodness & Murray, 2007; Griffith-Jones, 2012; Odoni & de Neufville, 1992; Ross, 2013). The airport experience of the business frequent flyer is quite separate from the experiences of the other airport passengers by virtue of various fast-track privileges and access awarded to these passengers to airline lounges (Ross, 2013). The segregated treatment of business frequent flyers affords them extra time, space and service during their airport experience. Another distinguishing characteristic of the group is that the members are experienced travellers, and as such, may not be representative of the “average” airport passenger. These specific characteristics are important to consider when examining the results of studies that are only conducted with this subset of passengers (Fodness & Murray, 2007; Odoni & de Neufville, 1992).

In addition to variations in passenger expectations that may exist between passenger segments, the expectations of passengers also change with the passage of time. Time has an impact on the needs of a passenger as appropriate to their particular stage in life (Erikson, 1980; Wareham, 2012; Wolfe, 2003). Time also has an impact on the general expectations of passengers, as caused by changes in the external environment. For example, Chiou and Chen (2010) found that with the proliferation of low cost carriers,
the expectations of passengers have changed from expecting good service, to expecting good value.

The effects of time are also evident when considering the aviation industry as a whole. In the half-century of commercial air travel, the industry has matured and the nature of air travel has changed dramatically (Copart, 2013a; de Neufville, 1995, 2008). In this time, the expectations of the travelling public have also morphed (Mayer, 2013; Port Authority of New York and New Jersey, 2012; Ramsden, 2013). The changes in the industry and in the expectations of the traveller have begun to alter the way that the industry approaches the understanding, and thus the segmentation, of their passengers.

Increasingly, the basic criteria used to segment passengers (purpose of trip and frequency of travel) no longer provide adequate insights into the passenger experience. This is reflected in emerging research which is looking at more meaningful ways to segment and understand the modern travelling public (Livingstone, 2014; Persson, 2013; Port Authority of New York and New Jersey, 2012; Tarbuck, 2012a).

Airports are beginning to recognise the need to explore, at a deeper level, the core values of the passenger (Harrison, 2013c; Merchant, 2013; Mi Lim, 2013; O’Meara, 2013; Persson, 2013; Ramsden, 2013; Terrell, 2013). As an example, a recent study at Copenhagen International Airport resulted in a novel segmentation of the airport’s travelling public (Tarbuck, 2012a). The segmentation is shown in Figure 10.

The segmentation in Figure 10 shows a departure from the traditional approach to classifying passengers based on duration and purpose of flight (Shaw, 2007). The Copenhagen segmentation extends the traditional breakdown based on frequency of travel by augmenting it with a pseudo “degree of engagement” by the passenger in the airport environment. As an example, the Attention class of passengers has high expectations of service, yet few expectations of the airport environment (with which they have limited engagement). By contrast, the Experience passengers are most highly engaged in the service, and the environment provided in the terminal building.
In a recent study of passenger retail behaviour, Livingstone found that retail activities are strongly influenced by the structure of the passenger group (Livingstone, 2014; Livingstone, et al., 2012). Livingstone argues that landside retail spend is heavily influenced by the presence of wavers, or non-flying group members, who accompany the passenger to the airport. The airside retail engagement, on the other hand, is influenced by the presence of companions, or flying group members. The segmentation of passengers based on these key factors which influence their retail spend leads to a more meaningful understanding of how passengers engage in retail activities, than when viewed from the traditional breakdown based on the basic criteria (nature of trip and frequency of travel).

A further example of a trend towards a deeper level of segmentation is the research recently undertaken at Swedavia AB (Hiller & Forssell, 2013; Persson, 2013). In this work, the researchers also departed from the basic segmentation criteria and instead created groups reflective of general lifestyle preferences of humans, rather than specific characteristics of passengers in airports. As an example, the Swedavia “Active Cosmopolitan” category is described as the set of passengers who are modern, sensitive,
enjoy travel and luxury but are also socially and environmentally aware (Persson, 2013).
This more holistic approach to segmenting passengers reflects the general shift towards
incorporating passenger experience considerations into the design of the terminal.

In the next section, the theoretical foundations of human and passenger experience
presented in this chapter are abstracted into a conceptual model of passenger
experience. The conceptual model was used as a framework for this research.

3.5 Conceptual model of passenger experience

The conceptual model presented in this section is derived from the literature reviewed
in this Chapter. In particular, the model draws on the presentation format of SERVQUAL
(Parasuraman, et al., 1988) and the concepts of experience described by Pine and

The conceptual model is represented through a graphical notation. The graphical
notation provides a high-level abstraction of the mathematical relationships that
underpin the model, and is introduced for reasons of clarity and ease of understanding.
The mathematical formulae that underpin the conceptual model are detailed in
Appendices M and N. The connection between the model and the underlying formulae
constitute a specification (Eriksson, 2004) for the development of a programmable tool
to assist in airport design and planning.

The syntax of the graphical representation used in the conceptual model is shown in
Figure 11. Elements, such as Staged Experience or Past Experience, are represented as
(1) and (4) in Figure 11: i.e. an element (1) is defined as a relationship between several
factors (2, 3) and an element (4). The definition of an element in terms of (previous
instances) of the same element is based on the concept of “recursion” in computer
science (Alfred & Ullman, 1995). Recursion is defined as a method by which a solution to
a problem is defined in terms of solutions to (previous instances) of the same problem
(Alfred & Ullman, 1995). It is chosen here as it represents a natural way to model certain
aspects of the passenger experience, for example satisfaction is both the difference
between expectations and perceptions (Norman, 2009), and perceptions and
expectations are in turn affected by prior levels of satisfaction (Norman, 2009).
Theoretical factors of passenger experience, derived from the literature presented in section 3.2, are represented as (2). Boolean factors, i.e. those factors that can have only one of two possible values (such as True or False, or Yes and No), are represented as (3). Operations on elements or factors, such as sum or multiplication, are represented as (5). This syntax is also used to represent the extended conceptual model in Chapter 7.

![Figure 11: Description of the syntax used in the conceptual model](image)

From an examination of terminal design (Chapter 2) and discussion of passenger experience (this chapter), it has been established that from the passenger’s perspective, passenger experience is subjective, measured by satisfaction and influenced by various factors (Csikszentmihalyi, 1991; Harrison, et al., 2014; Harrison, et al., 2012; Kirk, Harrison, Popovic, & Kraal, 2014; Norman, 2009; Pine & Gilmore, 2011). In contrast, the passenger experience, when considered from the perspective of the airport operator, is very different in nature (de Neufville & Odoni, 2003). From this operational vantage point, the passenger experience is objective and measured through objective metrics of time and space (ACRP, 2011; IATA, 2004).

The distinction between operational and passenger interpretations of experience are represented explicitly in the conceptual model introduced in this section (Harrison, et al., 2012). In the model, the objective (operational) perspective is represented by staged experience. The subjective (passenger) experience is deconstructed into five distinct
types: (i) past, (ii) expected, (iii) perceived, (iv) satisfaction (measure of experience) and (iv) public experience (the collective satisfaction of all passengers).

The relationships between the objective and subjective experience types are shown in Figure 12. Each category of experience is described in detail in the following sections. The mathematical relationships that underpin the model in Figure 12 are shown in Appendix M.

3.5.1 Objective airport perspective

Staged experience
In the conceptual model (Figure 12), the airport’s perspective of passenger experience represents the “staged experience” concept introduced by Pine and Gilmore (1999). The staged experience is objective from the airport’s perspective and forms the basis for employee performance benchmarks, for example, average time to check-in a passenger. These benchmarks are measured largely though the industry Level of Service (LOS) metrics (ACRP, 2011), and provide an objective view of the time, space, and satisfaction of passengers in an airport.
The objective nature of the staged experience provides a useful base point for airport planning and evaluation of airport performance from a managerial perspective, e.g. *does the terminal adequately handle the passenger traffic now, and in the future?* However, as this experience category provides an objective reflection on the passenger experience, it does not communicate information about the *experience of passengers, from their perspective*. This distinction is important to consider, especially when interpreting the results of studies based on current LOS metrics.

The staged experience can be expressed as:

> Staged Experience is a function of the objective measure of SPACE, objective (clock) TIME and the PROCESS that a passenger is experiencing (check-in, security, customs, boarding).

The relationship between Staged Experience and TIME (objective), SPACE and PROCESS can be represented as shown in Figure 13.

![Figure 13: Staged Experience](image)

In Figure 13, TIME (objective) is an objective measure of time (as represented in Figure 7), SPACE is an objective measure of recommended space per passenger (m²), and PROCESS refers to one of the four necessary activities in international departures (check-in, security, customs, boarding).
3.5.2 Subjective passenger perspective

In contrast to the airport’s objective perspective of experience, the passenger’s understanding of experience is subjective (Harrison, et al., 2012). As a consequence, the experience of the airport and that of the passenger are represented as separate conceptual entities in Figure 12. For the passenger, experience is a culmination of prior experience (both first hand, and as learned from others), expectations and actual perceptions at the time of the experience satisfaction (Csikszentmihalyi, 1991; Harrison, et al., 2012; Norman, 2009). Each of the subjective experience elements shown in Figure 12 is described in more detail in the following sections.

Public experience

The public experience represents the collective experience of all passengers, as re-told through word of mouth and social networks (Carroll, 2012). Research in other contexts has shown that people tend to remember the start, the end and the most memorable (good or bad) events from the middle (Mori, 2008; Norman, 2009).

Public experience is the entity which is recorded formally by aviation surveying firms and informally through a variety of social-media channels (JD Power, 2011; SKYTRAX, 2011c). These less formal social networking channels should not be overlooked in terms of their power to influence public experience. Dave Carroll’s damaged guitar serves as the landmark case, illustrating the power of “one voice” when amplified through social media channels (Carroll, 2009, 2012).

The collective public experience can be expressed as:

*Public Experience is the collection (sum) of the SATISFACTION of all passengers.*

The relationship between Public Experience and SATISFACTION can be represented as shown in Figure 14.
In Figure 14, SATISFACTION is a measure of the collective satisfaction of all passengers, i.e. it is the difference between the passengers’ expected and perceived experience (2009). Satisfaction is represented in Figure 18 in this section.

**Past experience**

The past experience of the passenger is the value proposition of the passenger experience (Pine & Gilmore, 1999). It represents the relationship that the airport has established with the passenger through repeat interactions (direct) and the “word of mouth” opinions of others (indirect) (Parasuraman, et al., 1985). Past Experience is subjective, informs personal expectations and thus has a direct impact on satisfaction. Through transitive closure, past experience of a passenger influences the choices of other travellers.

The past experience of a passenger can be expressed as:

*Past Experience is a function of a passenger’s SATISFACTION with a given experience, the collection (sum) of the passenger’s PAST EXPERIENCE and the influence of the general PUBLIC EXPERIENCE.*

The relationship between Past Experience, SATISFACTION and PUBLIC EXPERIENCE can be represented as shown in Figure 15.
In Figure 15, SATISFACTION is a measure of the satisfaction of a passenger’s experience (Figure 18), PAST EXPERIENCE represents the passenger’s past experience and PUBLIC EXPERIENCE is the collective experience of other passengers (as represented in Figure 14).

**Expected experience**

A passenger’s expected experience represents the expectations that the passenger has of a particular experience. Of note, expected experience is subjective and not necessarily reflective of the airport’s staged experience (Pine & Gilmore, 2011). This category of experience is influenced by a passenger’s prior experience and the dynamics of the experience offering itself (Norman, 2009). From the discussion in Chapter 3, it was established that this experience offering is influenced by four key factors: (i) service, (ii) time, (iii) environment and (iv) artefacts.

As an example, a passenger’s expectations about the duration of the check-in process will be formed by what they have experienced in the past (*check in usually takes 45 minutes*) and by what they can ascertain about the current situation (*the queue looks short but has not moved in the last 30 minutes*).

The expected experience of a passenger can be expressed as:
Expected Experience is a function of a passenger’s subjective interpretation of TIME, their PAST EXPERIENCE and the objective, STAGED EXPERIENCE.

The relationship between Expected Experience and TIME (subjective), PAST EXPERIENCE and STAGED EXPERIENCE can be represented as shown in Figure 16.

![Figure 16: Expected Experience](image)

In Figure 16, TIME (subjective) is a passenger’s interpretation of time, as moderated by the experience itself (Figure 8), PAST EXPERIENCE is the past experience of the passenger (Figure 15), and Staged Experience is the objective experience offering (Figure 13).

**Perceived experience**

Perceived experience represents the interpretation of a particular experience by a passenger at a given time (Csikszentmihalyi, 1991; Norman, 2009). Note that this entity represents an interpretation of the experience being engaged in, and not the actual (staged experience) itself (Pine & Gilmore, 2011). As described by Norman (2009), because of the nature of human memory, perceptions of an experience are subject to distortion both during, and after, the experience itself.

Perceived experience is subjective and dynamic in nature, and influenced by artefacts, services, time and the environment, i.e. the staged experience. For example, a flight delay is likely to be perceived as longer in the presence of poor service than in the
presence of good service (Norman, 2009). Perceived experiences are also influenced by expectations, for example, a 20 minute wait may be perceived as short if the passenger was expecting an hour wait; conversely, the same 20 minute wait can be perceived as long if the expectations were 5 minutes (Csikszentmihalyi, 1991; Norman, 2009).

The perceived experience of a passenger can be expressed as:

\[
\text{Perceived Experience is a function of a passenger's subjective interpretation of TIME, their EXPECTED EXPERIENCE and the objective, STAGED EXPERIENCE.}
\]

The relationship between Perceived Experience and TIME (subjective), EXPECTED EXPERIENCE and STAGED EXPERIENCE can be represented as shown in Figure 17.

In Figure 17, TIME (subjective) is a passenger’s interpretation of time, as moderated by the experience itself (Figure 8), EXPECTED EXPERIENCE is the expected experience of the passenger (Figure 16), and STAGED EXPERIENCE is the objective experience offering (Figure 13).

**Passenger satisfaction**

Passenger satisfaction represents the difference between a passenger’s perceived and expected experience (Norman, 2009). Regardless of the objective measures of the staged experience, if a passenger’s expectations are met, he/she will be satisfied with the experience (Norman, 2009). For example, an anxious passenger in an unfamiliar
terminal will have few expectations of finding their way to their departure gate. Upon finding the desired gate on time (expectations met) the passenger is likely to be satisfied. As shown by Norman (2009), the degree of the passenger’s satisfaction is influenced by factors such as service (finding a staff person willing to help with directions).

Passenger satisfaction can be expressed as:

*Satisfaction is the difference between a passenger’s PERCEIVED EXPERIENCE and their EXPECTED EXPERIENCE.*

The relationship between Satisfaction and PERCEIVED and EXPECTED EXPERIENCE can be represented as shown in Figure 18.

![Figure 18: Satisfaction](image)

In Figure 18, PERCEIVED EXPERIENCE is the perceived experience of the passenger (Figure 17) and EXPECTED EXPERIENCE is the expected experience of the passenger (Figure 16).

### 3.6 Factors of passenger experience influence

The conceptual model introduced in Figure 12, augmented with the extended definition for each experience type, is shown in Figure 19.
The model in Figure 19 articulates the factors that influence each of the experience types. From this model, it can be inferred that:

1. Staged Experience is influenced by the factors SPACE, TIME (objective) and PROCESS.
2. Past Experience is influenced by the passenger’s Satisfaction, Past Experience and the collective Public Experience.
3. Expected Experience is influenced by the passenger’s Past Experience, the Staged Experience they encounter in the terminal on the day of travel, and the factors that influence TIME (subjective): SERVICE, ARTEFACT, ENVIRONMENT and TIME (objective).
4. Perceived Experience is influenced by the passenger’s Expected Experience, the Staged Experience they encounter in the terminal on the day of travel, and the factors that influence TIME (subjective): SERVICE, ARTEFACT, ENVIRONMENT and TIME (objective).
5. Satisfaction is the difference between the passenger’s Perceived and Expected Experience.
6. Public Experience is the collective Satisfaction experienced by past travellers.
The model summarised in Figure 19 was developed from the theoretical foundations discussed in Chapters 2 and 3. The factors that were identified as influential in the various experience types were tested for validity in this research. The plan for the validation of these factors is presented in the following chapter (Chapter 4).

### 3.7 Summary
According to IATA (2012), global air passenger traffic is expected to reach 3.6 billion in 2016. This represents just under half of the total predicted world population for the same year (U.S. Bureau of the Census, 2012).

The growth in passenger traffic reflects the culmination of changes in the air travel industry since the early days of commercial air travel. De-regulation and the emergence of low cost carriers in the early 1970’s, together with the proliferation of the internet and resulting “price transparency” in the industry, have contributed to making air travel accessible to the mass markets (Causon, 2011; de Neufville, 2008; Kazda & Caves, 2007; Peterson, 2011; Rigas, 2006; RITA, 2012b). Air travel has become a commodity, much like sugar, gold and coffee beans.

By definition, commodities are indistinguishable from each other. As commodities are transformed into goods, services and experiences, the added differentiation results in a corresponding price increase (Pine & Gilmore, 2011). In aviation, however, the pattern has been reversed: what started out as “experience” in the truest form (offered at a comparably high price point), has been transformed into a commodity with little differentiation and a low price point. From this, it can be inferred that in order to increase profitability in aviation, one should look towards creating “experience” offerings.

Passenger experience has become a key industry focus, and today influences all areas of aviation, including technology, design, planning, retail, and even the environment (Deillon, 2013). As a consequence of various parallel, yet unrelated, world developments, the passenger’s role has shifted from being an outsider, to being an involved stakeholder in the aviation equation (Behan & Craig, 2012; de Groof, 2012; Mayer, 2012). In the current state of the industry, a lack of focus on the passenger experience will not only impact potential profits, but also inspire losses (Wagnert, 2013).
Although the topic of “passenger experience” is generally regarded as one of the key areas of investigation in aviation today (Deillon, 2013; Harrison, et al., 2012; Jager & Ofner, 2012), passenger terminals continue to be designed for the future passenger experience, without much confidence or knowledge regarding what the future, or the current, core values of the passenger actually are.

Drawing on the general body of literature on human experience, a definition of passenger experience was proposed (Arendt, 2013; Csikszentmihalyi, 1991; Hall, 1976; Schifferstein & Hekkert, 2011; Varela, 1993). From the definition of passenger experience, insights from Shostack’s (1982) work on service design and Pine and Gilmore’s (2011) work on the experience economy, a conceptual model of passenger experience was derived. The conceptual model articulated the difference between the objective (airport) and subjective (passenger) perspectives of passenger experience (Harrison, et al., 2012). The model also described the relationships between the experience types, and identified the (theoretical) influence of four factors: time, service, environment and artefacts. The actual influence of these four factors was investigated in the field studies carried out as part of this research (Chapters 5 and 6). The conceptual model is extended with the results of this research, and presented in Chapter 7.

The conceptual model presented in this chapter, together with the mathematical equations that underpin the model (as described in Appendix M) form the beginnings of a specification for the development of tools to assist airport planners and designers (Eriksson, 2004). The linkage between the model and the programmable equations provides a degree of practical applicability that distinguishes this work from that of Pine and Gilmore and Parasuraman et al. (Parasuraman, et al., 1988; Pine & Gilmore, 2011). The conceptual model and underlying equations, and thus specification, are extended with the results of this research in Chapter 7.

The theoretical framework used in this research, and resulting plan for the investigation of factors of passenger experience influence and modes of engagement are described in Chapter 4.
Chapter 4. Research Framework

There are many ways in which new knowledge is created. In most cases, however, the journey begins with a passionate desire for discovery, or adventure of the mind:

> Discovery is at the heart of research... all research begins with collecting clues that are intriguing, but are not immediately obvious in themselves... a good problem, something puzzling and promising, is half of discovery. One must be able to see a problem and sense a direction towards a solution where others see none, and eventually arrive at a solution that is surprising to all. (Pohn, 2005)

Although it is generally accepted that good research occurs when new and useful knowledge has been acquired, the exact process by which this happens is not prescriptive. Even the most objective scientific experiments begin as subjective seeds: which of these seeds are planted, watered and allowed to flourish is subjectively determined by the researcher based on the cumulative sum of their knowledge, experience and creativity. Ultimately, however, irrespective of the approach used for the generation of new knowledge, in order for the results to be admissible as “research” the process followed must be rigorous, repeatable, free of bias and the results themselves must be generalizable (Bauer & Gaskell, 2000; Corbin & Strauss, 2008; Denzin & Lincoln, 2003; Flick, 2009; Mays & Pope, 1995; Rowe, 1991).

In this chapter, the qualitative research framework for this research is presented and the method used in this research is described. A plan for the investigation of the research questions concludes the chapter.

4.1 Approaches to qualitative research

The study of experience falls into the qualitative rather than quantitative school of thought (Corbin & Strauss, 2008; Csikszentmihalyi & LeFevre, 1989; Denzin & Lincoln, 1994; Flick, 2009; Patton, 2002). In general, qualitative methods aim to understand behaviour through human centred approaches, whereas quantitative methods take a more mathematical approach to explaining human behaviour.
Qualitative methods came into view in the early 1900’s, at which time researchers rejected the notion that there is an “objective” view of the world that can be empirically verified. Since then, various schools of thought have emerged which have fragmented qualitative research into numerous camps including ethnography, grounded theory, phenomenology, ethical enquiry and historical research (Corbin & Strauss, 2008; Denzin & Lincoln, 1994; Flick, 2009; Patton, 2002; Seidman, 2006; Sommer & Sommer, 1997). Regardless of methodology, qualitative data collection approaches aim to uncover the truth behind a given phenomenon or hypothesis. It is believed that the researcher’s role is to observe, understand, analyse and report, in a balanced way, any outcomes or conclusions identified (Patton, 2002).

One of the key goals of this research was to develop a deeper understanding of the relationships between passengers and their experience in an airport terminal building. Given the nature of the proposed investigation, a qualitative approach to data collection was adopted. A comparison of the techniques currently utilised by quantitative researchers in the field is presented in the following sections.

4.1.1 Surveys and Questionnaires
A common method of collecting data related to passengers and their expectations in an airport environment is through the use of questionnaires and surveys (Correia, et al., 2008b; de Barros, et al., 2007; de Groof, 2012; Fodness & Murray, 2007; Gilbert & Wong, 2003; Mayer, 2012; Tarbuck, 2012a). The effectiveness of these approaches rely heavily on the design of the questions and the implementation of the questionnaire or survey (International Sociological Association, 1998). It is possible that an incorrectly designed set of questions can produce misleading results. A great deal of skill lies in the construction of the questions: knowing what to ask, what not to ask, and how to ask without leading or introducing bias (Phillips & Hamburger, 2007; Sommer & Sommer, 1997). It is equally important to ensure that the questionnaires or surveys are administered in a consistent manner so that the process can be repeated reliably (Flick, 2009).

As important as knowing what to ask is knowing who to ask. A questionnaire or survey must be conducted on a subset of the population that is representative of the whole.
Surveys such as SKYTRAX which poll millions of passengers annually may be more representative than surveys conducted on a particular passenger subset. As an example, the study by Odoni and de Neufville (1992) only collected data from frequent flyers, a subset of passengers whose views may not be representative of the larger passenger population.

Although surveys such as SKYTRAX survey millions of passengers, care must be taken in interpreting the actual data that is collected. In general, information gathered in this manner is useful for indicating a trend, or making broad comparisons, however, the results should not be taken literally. As an example, although Hartsfield-Jackson International Airport (ATL) is rated as a 3-star airport by SKYTRAX (2011c), 62% of respondents make very negative comments about the arrivals process (2011b). Inspection of other airports in SKYTRAX supports the general discrepancy between the ratings assigned, and the comments posted by passengers. A similar phenomenon has been noted in a review of the Passenger Facilitation data collected by Australian Customs (2008-2009).

A further complication of surveying and questionnaire administration, as noted in Correia et al. (2008b) is that many of the questions asked of the respondents are based on their recalling past events, or predicting future events, a process which is often an inaccurate feat (Norman, 2009). For this reason, Csikszentmihalyi and LeFevre (1989) argue that questionnaires are not a reliable method for measuring the quality of a person’s experience. Instead, they propose a methodology tailored specifically to the collection of experience data: the Experience Sampling Method (Csikszentmihalyi & LeFevre, 1989).

Surveys and questionnaires also suffer from the implicit restrictions imposed on the respondent’s set of answers by virtue of the questions asked. As such, the omission of a question from the survey or questionnaire can fail to uncover potentially important relationships. This limitation may be overcome if the surveys or questionnaires are formulated on the basis of insights from observational researchers (Fodness & Murray, 2007; Sommer & Sommer, 1997).
4.1.2 Experience Sampling Method

Csikszentmihalyi and LeFevre’s (1989) Experience Sampling Method (ESM) was developed to collect data about human experience. The ESM collects samples of experience through the administration of questionnaires completed during the course of a week. The participants are equipped with a pager that is set off at random times during the study period. When the pager goes off, the participants complete a page of their questionnaire booklet. The method is effective in that it captures a “thin-slice” (Gladwell, 2005) of a person’s experience at a particular point in time and in the native environment.

In the context of the airport passenger experience, the ESM is not directly applicable as the duration of the experience is much shorter (hours as opposed to years). A further distinction is the partially ordered nature of the airport experience, that is, there is a clear ordering of activities that must be done, possibly interspersed with (more random) discretionary activities (Kraal, Popovic, & Kirk, 2009). This differs from the reasonably random pattern of life itself as sampled by the ESM.

The ESM method does however highlight the importance of collecting experience data in context of the experience itself. The collection of data in-situ avoids the distorting effects of recall and the inaccuracies associated with human memory (Mori, 2008).

4.1.3 Semi-Structured Interviews

The semi-structured face to face interview has not been extensively used in the collection of passenger experience data, although some researchers have used interview techniques as a secondary data collection method (Kirk, et al., 2012; Livingstone, et al., 2012). In these studies, the interviews have been conducted via telephone and have been used to verify the primary observational data.

As a data collection technique, the face to face interview is expensive and complex to administer in a balanced, reproducible and consistent manner (Patton, 2002). Much of the success of the interview technique lies in the skill of the individual interviewer. Like a good journalist, a skilled interviewer is able to build instant rapport, engage and draw out without leading or introducing bias (Flick, 2009; Seidman, 2006).
Despite the challenges, face to face interviews provide a wealth of non-verbal social cues, such as body language or facial expression (Gladwell, 2005; Opdenakker, 2006). As an example, Seidman (2006) recalls an interview in which his participant was reporting on his experience as a teacher in a very positive, although overly formal, manner. Seidman probed the participant towards the end of the interview about the discrepancy that he had noticed, which led to the participant releasing his frustration, and ultimately painting a very different picture of his teaching experience than what he initially conveyed with his actual words.

A common criticism of the semi-structured interview is that the technique relies too much on the skills of the interviewer (Corbin & Strauss, 2008; Flick, 2009; Opdenakker, 2006; Patton, 2002). There is no doubt that good interview technique is an art form, however, it is an art form that can be learned and refined. Seidman (2006) provides a number of practical techniques which an interviewer can employ to improve his/her level of skill. These techniques are focussed on: (i) active listening, (ii) building rapport with the participant, and (iii) gaining the participant’s confidence and trust.

The work of Cialdini provides valuable insights into how to achieve (ii) and (iii) above (Cialdini, 2001). Cialdini’s work into the principles of human influence may seem like the antithesis to creating unbiased interview scenarios. However, an understanding of what influences people can be leveraged to ensure that impartiality and authenticity prevail in the interview. In particular, the principles of consistency (self-justification for one’s choices) and social-proof (everyone else thinks this, so it must be ok) can be employed by the interviewer to draw out themes that participants may be shy or uncomfortable about revealing.

4.1.4 Direct Observation

Direct observation can be described as unobtrusive “spying” of participants in their natural setting (Flick, 2009; Patton, 2002). Traditionally, the researcher would make notes, audio and/or video recordings of the participants and then analyse the data for emerging themes or patterns. Modern observational researchers have benefited from advances in technology in both hardware (video equipment is now compact and inexpensive) and software (utilities like Noldus Observer XT assist in the management of observational data).
and analysis of video data). Despite these advances, direct observation remains an expensive data collection technique due to the man-hours required to collect and analyse the data.

As a tool for collecting data about human experience, direct observation has the advantage of being an authentic reflection of a person’s experience as it eliminates the distortion introduced by recall, reconstruction, or verbalisation of events (Healy, Beverland, Oppewal, & Sands, 2007; Mori, 2008; Norman, 2009). Direct observation can also uncover patterns in behaviour that a participant may not have been aware of themselves (Sommer & Sommer, 1997). The technique can also be useful for recording discrepancies between what is expected and what actually occurs (Yen & Teng, 2003; Yen, et al., 2001). As an example, the technique has been used to identify discrepancies between actual and perceived passenger crowding in areas of an airport terminal (Yen & Teng, 2003).

Although direct observation is useful in identifying discrepancies, it is limited in explaining the reasons for the discrepancy. In order to determine reasons for certain behaviour, it is useful to augment observations with follow up interviews or questionnaires (Popovic, et al., 2010; Yen & Teng, 2003; Yen, et al., 2001).

4.1.5 Augmented Observation

On the basis of the strengths and limitations of methods currently used, this research used a hybrid methodology for data collection, or augmented observation. Augmented observation is based on the direct observation methods augmented with semi-structured interviews (Popovic, et al., 2010; Seidman, 2006; Sommer & Sommer, 1997; Yen, et al., 2001).

The direct observation techniques were used by Popovic et al. (2010), Yen et al. (Yen, et al., 2001), and later by Livingstone (2014) and Kirk (2013) for the collection of passenger related data in airport terminal buildings. The researchers collected their primary data by video recording of participants from an unobtrusive distance. In all of these works, the primary video data were augmented with information from passenger surveys and semi-structured interviews.
In this research, these techniques were extended, making the researcher an active, albeit non-involved, party in the passenger experience. This was achieved through changing the recording mode from video to audio, thereby reducing the physical distance between the researcher and the participant. The recording mode was changed from video to audio for two reasons: (i) the participants were observed to be more comfortable in the absence of a video camera, and (ii) by reducing the physical distance between the researcher and participant, participants were observed to be more open and willing to share their airport experiences.

By conducting the interviews in the airport terminal, direct access to the passengers’ actual experience was afforded. This helped to optimise the authenticity of the passenger experience data by reducing the distorting effects of recall (Csikszentmihalyi & LeFevre, 1989; Norman, 2009).

As a data collection methodology for the study of experience, augmented observation has several strengths. Firstly, the context in which the data is collected has a significant impact on the quality and authenticity of the research outcomes. It is acknowledged that human memory is fallible, thus any data collection that relies on recall will necessarily be inaccurate. People have a tendency to rationalise and re-create what they cannot remember. By observing people in-situ, these challenges are mitigated.

Secondly, the choice of words used in conducting interviews influence the results obtained. Surveys and questionnaires for example limit the responses to the set of questions asked (Minker, 1982; Reiter, 1977). By their very nature, they exclude the possibility of uncovering the unknown, as it is not possible to ask that which is not yet known. Keeping interview questions open ended and not leading is essential when conducting exploratory style research.

Thirdly, it is imperative to establish rapport with the participant. Rapport is possibly the most important element of this style of data collection (Cialdini, 2001; Sommer & Sommer, 1997). In general, the interviewer has approximately 10 seconds in which to establish rapport: trust, likeability and camaraderie. Failure on this element almost guarantees that honest and deep insights will not be uncovered.
The most notable limitation of augmented observation as a data collection methodology is the inevitable infusion of the researcher’s self into the data collection process. Although unrestricted and random influence could lead to the collection of skewed data, this risk was addressed through maintaining an awareness of: (i) consistency in the interview technique between participants was made easier as the interviews were all conducted by the same researcher; and (ii) interview questions were phrased in an open ended manner, and care was taken to minimise influence on participant responses (refer to Appendix C for a sample interview transcript). Thus, as noted by Douglass and Moustakas (1985), when applied in a consistent and methodical manner, the experience and influence of the researcher can be viewed as an advantage rather than a limitation of the research.

4.2 Research process
In this research, the process used for the discovery of core passenger values is based on an amalgamation of several scientific methods borrowed from the field of heuristic enquiry (Douglass & Moustakas, 1985). Although the specifics of heuristic enquiry are directed to the exploration of self, or personal experience, the process defined by Douglass and Moustakas can be adapted to the observation and study of general human experience:

1. Contextualisation: exploration of the question, problem or theme from a theoretical basis (literature review).
2. Acquisition: collection of data through augmented observation of passengers and site visits conducted at international airports.
3. Synthesis: extraction of meaning from the data through analysis and triangulation against independent data sources.

The process of enquiry, as shown in Figure 20, is not linear. In the beginning, contextualisation is provided from a theoretical perspective. As this theoretical knowledge base grows, it can be applied to the acquisition of data and also to the synthesis of results. In practice, data collection and analysis mutually enhance and inform each other.
The process of enquiry (Figure 20) is both scientifically objective and creatively subjective, reflecting the ethos of the qualitative approach on which this research is based (Denzin & Lincoln, 1994; Flick, 2009; Patton, 2002). In the contextualisation phase (Figure 20), for example, the decision about which research question to pursue and which to discard, how to define the boundaries of the research project and how to approach the analysis of data are influenced by the experience and skill of the researcher. This should not be regarded as a limitation of the research method, but rather acknowledged as its strength:

*Perhaps more than any other component, passion in the process of discovery distinguishes [heuristic] search... when to probe deeper, when to shift the focus, when to pause to examine... when to reflect, when to describe... all are considerations of timing and attunement that demand a disciplined sensitivity if the nature and essence of an experience is to be revealed.* (Douglass & Moustakas, 1985)

In contrast, the acquisition phase (Figure 20) is an objective process, defined by the extensive body of knowledge on the process of data collection using qualitative research methods (Corbin & Strauss, 2008; Csikszentmihalyi & LeFevre, 1989; Denzin & Lincoln, 1994; Douglass & Moustakas, 1985; Flick, 2009; Patton, 2002).

The synthesis phase (Figure 20) reflects a combination of objective and subjective influence. The process of analysis, aided by tools such as Noldus Observer (2011) and
Atlas.ti (2011), is strictly objective. However, the decision of how to construct the coding scheme and run the analysis is not prescriptive and relies on the experience of the researcher.

The following section describes how the general process of enquiry was applied to the investigation of the two research questions.

4.3 Research design

The first part of this chapter described research approaches on which this research was based. This section describes the field studies and site visits (acquisition phase in Figure 20) that were designed to address the two questions in this research: (i) what are the factors of influence of the passenger experience, and (ii) what are the modes of passenger engagement in the terminal building.

4.3.1 Ethical clearance

The field studies conducted as part of this research were carried out in accordance with Queensland University of Technology's ethical standards and guidelines, as per QUT Ethics Approval 1100001377 (Appendix A). As required by the ethics guidelines, participants were provided with information regarding the field study being undertaken (Appendices B and F). In addition, field study two participants were asked to complete an image release form (Appendix G). The data collection was conducted at Brisbane International terminal in co-ordination with Airports of the Future project (Australian Research Council Linkage Project, 2011).

4.3.2 Field study one: Factors of influence

The main goal of field study one was to perform exploratory inquiry into the factors that actually influence the passenger experience in the terminal building. These goals were expressed as the following research questions:

1.1. Which of the potential factors (time, service, environment, artefact) actually influence the passenger experience?

1.2. What is the relative importance of these factors?

The questions above were approached using a hybrid mix of qualitative methods tuned for collecting passenger experience data in an airport environment.
The data collected for this research was collected *in-situ* at Brisbane International Airport during February 2012. Interviews were conducted with 150 opportunistically selected passengers in the departures section of the passenger terminal. In the context of this research, the departures process consists of four steps: (i) check-in, (ii) security, (iii) customs and (iv) boarding (Kirk, et al., 2012).

The passengers were initially asked only one question: “How was your airport experience today?”. The question asked of the participants was deliberately simple, and minimally pre-emptive, so as not to influence their responses.

The passenger interviews and field notes were recorded using AudioNote on an iPhone (2013). The audio files were transcribed and coded using Atlas.ti (2011). The transcripts were coded against the four factors that influence passenger experience, as described in Chapter 3: (i) time, (ii) service, (iii) environment and (iv) artefacts (Harrison, et al., 2012). A randomly selected subset of interview transcripts was re-coded after six months by the same researcher in order to validate the coding.

Field study one methods, results and analysis are described in detail in Chapter 5.

### 4.3.3 Field study two: Modes of engagement

The main goal of field study two was to gain a deeper understanding of the relationship between passengers and their key factor(s) of influence, or core values. These goals were expressed as the following research questions:

2.1. How do passengers relate to their key factor(s) of influence?

2.2. What are the modes of passenger engagement in the terminal building?

As in field study one, the augmented observation method was used to answer the above question. In field study two, however, the interviews conducted aimed to understand not just what, but also why. For this reason, in-depth interviews were carried out with 49 passengers. The interviews were conducted in the departures section of Brisbane International Terminal.

The participants for field study two were met at the entrance to the departures section of Brisbane International Terminal by the researcher. The interview spanned the
duration of their departure journey, i.e. from kerb to boarding gate. The passenger interviews and field notes were recorded using AudioNote on an iPhone (2013). The audio files were transcribed and coded using Atlas.ti (2011) using the following coding scheme: time sensitivity, degree of engagement, proficiency of traveller and purpose of travel. A randomly selected subset of interview transcripts was re-coded after six months by the same researcher in order to validate the coding.

The results from this field study were triangulated against the data set from field study one. The details of the method, results, data triangulation and analysis for this field study are described in Chapter 6.

4.3.4 Site visits

In addition to the two field studies, a component in developing a practical understanding of the passenger experience included site visits to 16 international airports. The site visits consisted of unstructured interviews and guided tours with aviation industry experts.


The results from these site visits were not formally recorded or analysed. However, the knowledge and insights gained from the first hand observation and discussions with industry experts added to the richness of perspective that informed each of the three phases of enquiry (contextualisation, acquisition and synthesis) (Douglass & Moustakas, 1985). Accordingly, the knowledge obtained from the site visits is reflected in the insights that are reported in Chapters 7 and 8 of this research (Goto, 2013b; Hehir, 2012; Hiller & Forssell, 2013; Kolatorski, 2012; Krause, 2012; Mayerhofer, 2012; Prabhakaran, 2013; Tarbuck, 2012b).
4.4 Summary

Research is to see what everybody else has seen, and to think what nobody else has thought. Szent-Gyorgi (Szent-Gyorgyi, 1937)

The discovery of new knowledge, as reflected in the words of Szent-Gyorgi (1937), often appears to be the result of luck, timing or inspired brilliance. In reality, the process of research is both subjectively creative, and also the result of many hours of hard work pursued in the context of a theoretically rigorous framework. For insights to be admissible as new knowledge, therefore, what begins as subjective seeds must be verified through theoretically sound methods and rigorous processes (Bauer & Gaskell, 2000; Corbin & Strauss, 2008; Denzin & Lincoln, 2003; Flick, 2009; Mays & Pope, 1995; Rowe, 1991).

Within this research approach, a number of qualitative methods for the collection of data and thus investigation of passenger needs were considered (Corbin & Strauss, 2008; Denzin & Lincoln, 1994; Mays & Pope, 1995; Popovic, et al., 2010). A hybrid approach, augmented observation, was used for the investigation of factors that influence the passenger experience (Harrison, et al., 2012). The collection of data in-situ mitigated issues associated with reconstruction of events (Mori, 2008; Norman, 2009) allowing access to authentic insights about the passenger experience, from the perspective of the passenger.

By interviewing passengers themselves, at the exact time of their airport experience, the researcher had the ability to investigate the factors that influence the passenger experience (Chapter 5) and uncover the modes of engagement between the passenger and the key factor(s) of influence (Chapter 6). The two field studies conducted are described in the following two chapters.
Chapter 5. Field study one - Factors of influence

This chapter presents the first of two field studies conducted as part of this research. The main focus of field study one was to explore which factors actually influence the passenger experience in the airport terminal.

On the basis of the literature review and an examination of current terminal design approaches, as described in the first three chapters of this thesis, four factors have been identified as potentially having an influence on the passenger’s in-terminal experience. The four factors are:

1. Service
2. Time
3. Environment
4. Artefact

The goal of this field study was to establish the relative importance of the above four factors in their influence on the passenger’s experience. The approach chosen to investigate this research goal was augmented observation, as described in Chapter 4.

The remainder of this chapter describes the field study one method, including participant recruitment and interview procedure, and presents the results. The chapter concludes with a discussion of how the results can be applied to formalise the conceptual model of passenger experience introduced in Chapter 3.

5.1 Research method

The data collection instruments were verbal transcripts and researcher interview notes. The data for this field study was collected *in-situ* at Brisbane International Airport during February 2012. In this time, 150 participants were interviewed. Of the 150 participants, 66% were travelling on holiday, 22% were travelling on business and the remaining 12% were non-travelling companions, or wavers. The detailed demographics for field study one participants are shown in Appendix D.
The participants were grouped according to their natural travel-companion groupings on their day of travel, for example: an interview with a family of four participants was treated as one “group” in the analysis phase. In this field study, the 150 participants corresponded to 66 separate passenger groups. All interviews were conducted in the departures section of the terminal (check-in, security, customs and boarding) (Kirk, et al., 2012).

The interviews followed the general pattern outlined in Appendix C. Participants were approached, greeted and asked a simple question: “How was your airport experience today?” The question asked of the participants was deliberately simple, and minimally pre-emptive, so as not to influence their responses. Passengers were then probed to elaborate on their responses: “…right, I see... can you tell me more about that?”.

Care was taken to conduct the interviews in a consistent manner that did not bias the participant into providing a certain response. This was partly achieved through an introductory sentence: “This is not a survey, there are no right or wrong answers... we just want to hear about your experience today.” This simple introduction established a quick rapport with the participant, allowing them to speak freely without influencing the specific direction of the conversation.

Participant responses were recorded using AudioNote on an iPhone (Luminant Software Inc, 2013). Researcher notes and observations were recorded using AudioNote, allowing all comments to be time stamped and correlated to participant interview data. A total of 06:57:07 hours of interview data were collected, with an average interview time of 06:19 minutes (Appendix D).

All audio recordings were transcribed and imported into ATLAS.ti (2011). The interview transcripts were coded for each of the four factors (time, service, environment and artefact). The coding scheme used in this field study is shown in Table 3.
5.1.1 Data coding process

The process of coding and analysis was based on a combination of content and thematic analysis techniques (Bauer & Gaskell, 2000; Boyatzis, 1998; Flick, 2009). The coding and analysis were implemented as two phases. In the first phase, the transcripts were coded against the four potential factors of passenger experience. In the second phase, the coded segments within each category were iteratively analysed for the presence of themes.

The coding of interview transcripts was carried out by the primary researcher (August 2012). The coding was validated by the same researcher six months after the initial coding phase was completed (February 2013). The validation included re-coding a randomly selected subset of the interview transcripts (10%). No significant differences in coding were discovered.

The coding phase involved importing the interview transcripts, analysing the text and assigning an appropriate code (SERVICE, TIME, ENVIRONMENT, ARTEFACT) each time a reference was made in the text. An example of how the coding was applied is shown in Figure 21: for instance, at time 00:00:44 PAX11 was focussing on TIME (“have to be there 90 minutes before the flight”); at time 00:00:56 PAX11 made references to both SERVICE (“it was fine”) and TIME (“went straight through”); while at 00:01:16 PAX11 spoke about ARTEFACTS (“oversized baggage”), TIME (“had to go and take something out”) and SERVICE (“it was all right”).
5.2 Analysis and results

This section outlines how the collected interview data were analysed, including results from the analysis. All analysis was performed using Atlas.ti software (2011).

5.2.1 Primary influence

The interview transcripts were coded according to the four proposed factors of influence (Table 3). Each reference by a passenger to one of the four factors was coded. This resulted in a total of 1212 coded segments. Of the 1212 coded segments, 37% referred to time, 26% referred to service, 20% referred to environment and 17% to artefacts. These results are shown in Figure 22.
These results suggest that not all of the four factors have the same importance, or level of influence, on the passenger’s overall experience. From the results in Figure 22, it appears that time is the most significant, or primary, factor, followed by service, environment and artefact.

5.2.2 Derived influence

During the process of coding the interview transcripts, it was noted that some participant references to a factor, such as service, were actually veiled references to the primary factor, time. An example extract from passenger 62 is shown below.

[check-in] it was good... it was quick. The guy was nice. [PAX62]

The above quote suggest that the participant is inferring that good service (service) is synonymous with fast service (time). In this example, the participant’s reference to the factor “service” is in fact an implied reference to the factor “time”. Accordingly, this interview segment was coded for both factors service and time in Atlas.ti, as shown in the example in Figure 23. For example, at 00:00:58 PAX62’s reference to SERVICE (“it was good”) is also an indirect reference to the speed with which he/she were processed (“it was quick”).

Indirect references to time were observed for the environment and artefact categories as well. As an example, passengers who spoke of an “uncrowded” terminal building (environment) were making an implied reference to the fact that their check in should be fast (time); passengers who spoke of liking automated check-in (artefact) inferred that this sped-up their check in process (time). These patterns in the interview data suggested that the primary factor, time, may actually be more important in its influence on the passenger experience than indicated by the results in Figure 22.
To gain a more accurate measure of the importance of time as a factor, co-occurrence analysis was performed on the interview data. The data were analysed for the co-occurrence of coded segments, with time being treated as the primary factor. The results of this analysis are shown in Figure 24.

Using time as the primary factor of influence, and adjusting for co-occurrence with secondary factors of service, environment and artefact, the importance of each of the factors changed to time (58%), service (16%), environment (12%) and artefact (14%).

Comparing the primary importance of each of the four factors (Figure 22) to their derived importance (Figure 24) it is evident that time is the more significant factor of influence in the passenger experience, and that service, environment and artefact are approximately equal but secondary factors.

Although the secondary factors (service, environment and artefact), were observed to serve as a proxy for the relationship between passengers and time, the analogous inverse relationships were not identified in the interview data. For example, passengers spoke of an “uncrowded” terminal building (environment) as a proxy for fast processing (time) – however, they did not speak of “fast processing” (time) as an implicit reference to an uncrowded or spacious terminal buildings (environment). Similarly, passengers did not refer to fast processing (time) as a veiled reference to automation (artefact). The derived relationships were found to be one-directional references to time.
5.2.3 How passengers relate to time

The results of this field study suggest that time is the most significant factor of influence in the passenger’s airport experience. In this section, the interview data is further analysed to extract the main themes that describe the nature of the relationship(s) between passengers and time.

The analysis was based on iterative application of thematic analysis techniques (Boyatzis, 1998). Emerging themes were coded as “memos” in Atlas.ti (ATLAS.ti, 2011) and refined as commonalities emerged. An example of how this phase of analysis was carried out is shown in Figure 25. The four segments from passengers 56, 52, 53 and 65 were coded as memos “responsibility” and “arrival time”: for example, at 00:01:47 PAX52’s statement “That’s why I try to get here early because there is always a hiccup somewhere along the line” is a reflection of both themes ARRIVAL TIME and RESPONSIBILITY, i.e. the passenger sees it as their responsibility to arrive “early” to mitigate the likelihood of any “hiccups” occurring at the airport.

<table>
<thead>
<tr>
<th>Time</th>
<th>PAX</th>
<th>Memo</th>
<th>Responsibility</th>
<th>Arrival Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:02:36</td>
<td>56</td>
<td>Yes, but we follow the rules, you see. It says get here, well, we think it says for an international flight get here three hours before, so, we pretty much do that.</td>
<td>RESPONSIBILITY</td>
<td>ARRIVAL TIME</td>
</tr>
<tr>
<td>00:01:47</td>
<td>52</td>
<td>That’s why I try to get here early because there’s always a hiccup somewhere along the line.</td>
<td>RESPONSIBILITY</td>
<td>ARRIVAL TIME</td>
</tr>
<tr>
<td>00:01:26</td>
<td>53</td>
<td>...we always go by the guidelines of what they say. And then you end up here for ages having coffee and something to eat afterwards. Which is much better anyway</td>
<td>RESPONSIBILITY</td>
<td>ARRIVAL TIME</td>
</tr>
<tr>
<td>00:00:05</td>
<td>65</td>
<td>Yes I arrived with plenty of time... pretty much what they tell me, yeah.</td>
<td>RESPONSIBILITY</td>
<td>ARRIVAL TIME</td>
</tr>
</tbody>
</table>

Figure 25: Example showing process of extracting themes from memos

In examining the example in Figure 25, it became evident that there was a common theme underlying the participant references to personal responsibility, arriving on time and allowing time for unexpected things that may happen on the day. These individual memos were abstracted into the theme that passengers use “time as a mitigator for risk” in the airport environment.
This iterative process of analysis uncovered eight key themes about the relationship between passengers and the primary factor of influence, time. These themes are discussed in the following sections.

**Passenger concern: Will I make my flight?**
The first theme to emerge from this analysis was the presence of an implicit concern shared by all passengers: “Will I make my flight?” This passenger concern is illustrated by the following interview segments:

> I was freaking out... well I made my flight ... but you know what, there were just too many things that went wrong there. I actually stopped booking that particular flight. [PAX46]

> This time I've arrived 2 hours before [departure] but that's because I drove from the Gold Coast. But to be very clear, I only left the Gold coast an hour before I got here, which is stupid because one traffic jam on the day, and I would have missed the plane. [PAX55]

Quite surprisingly, both passengers 46 and 55 were frequent flyers, each making approximately one international flight per month. This example suggests that the degree of concern that a passenger holds could be linked to their personal tolerance for risk rather than the frequency with which they travel.

It should be noted that the presence and strength of this theme may have been exaggerated due to the airport that the interviews were conducted at. A key characteristic of international flights departing from Brisbane is the relatively long time between flights by a carrier to a destination (usually in the order of days). As a consequence of this, the penalty that passengers pay if they do miss their flight can be quite severe: a missed flight to London may result in a 24-48 hour delay in travel. By contrast, the penalty for missing a flight from London to Frankfurt is far less severe (carriers often offer flights on the hour between major European destinations).

For some participants, such as passengers 46 and 55, the passenger concern was expressed explicitly. In other cases, the concern was inferred in the analysis phase based on the interview data and the interview notes (note that the question “are
you concerned that you will make your flight?" was never asked directly of the participants in order to prevent introducing interviewer bias). However, as the goal of every passenger in the terminal building is to catch a flight, and given the unpredictability of the airport environment, it is reasonable to infer that all passengers experience this passenger concern, to varying degrees, in the terminal building.

**Time as a mitigator for risk**

The second theme to emerge from the analysis of the interview data related to the way in which passengers manage this concern of “Will I make my flight?”. It was found that passengers use time as a mitigator for risk in the airport environment. Although passengers cannot predict what the exact cause of delays may be (long queues in security, weather delays or terrorist attacks), they adopt the strategy that if they leave a large enough margin of time for themselves in the terminal building, they will be able to reduce the risk of missing their flight.

Examining the interview segments from passengers 55, 56 and 7:

*This time I've arrived 2 hours before [departure] but that's because I drove from the Gold Coast. But to be very clear, I only left the Gold coast an hour before I got here, which is stupid because one traffic jam on the day, and I would have missed the plane. [PAX55]*

*Yes, but we follow the rules, you see. It says get here, well, we think it says for an international flight get here three hours before, so, we pretty much do that. [PAX56]*

*I always like to be here early. I got here about 2:45, and the flight leaves at 5:30... leaves a little time just in case anything goes wrong. You know, stuff like that, I like to leave early. [PAX07]*

It is clear that the passengers make a direct link between time (a variable within their control) and the likelihood of making their flight (a variable out of their control). Note that it is the arrival time at the airport that is seen as the variable over which the passenger has control: as long as the passenger arrives at the airport at the “recommended” time, that feel that they have done everything within their control to alleviate the concern of missing their flight.
By contrast, the remainder of the passenger’s airport experience was considered “out of their control”. The following segment illustrates this relationship between arrival time, and the unpredictability of what will actually happen in the airport on the given day of travel, as indicated by this segment from passenger 52:

“That's why I try to get here early because there's always a hiccup somewhere along the line... [today] everything is fine and dandy so far... don’t jinx us. [PAX52]

The use of the phrase “don’t jinx us” by passenger 52 clearly indicates the perceived unpredictability of the airport environment.

**Processing milestones reduce passenger uncertainty**

The third theme identified in the interview data relates to milestones in the airport terminal journey that mark a reduction in the passenger’s perceived level of uncertainty related to “Will I make my flight?”. The completion of each necessary activity in the departure journey (check-in, security/customs and boarding) reduced the amount of uncertainty associated with whether or not the passenger would make their flight.

The decrease in passenger uncertainty appears to be non-linear. Rather, the decrease in uncertainty seems to relate to the passing of two main milestones in the departure process: (i) dropping off baggage, and (ii) clearing security and customs.

The first milestone, baggage drop, occurred at check-in. The act of dropping off cumbersome luggage, as well as being registered in the airport system, emerged as a marker of relief for many passengers. The following segment from passenger 53 illustrates the point:

*I start to relax after check-in, because they know about me. If there's some reason you're tripped up in the process, there seems to be a fair effort made to make sure they don't leave you behind... so if I'm checked in I feel like I'm in the system... I feel like I'm being looked after to some degree. [PAX53]*

The second major milestone occurred when the passenger cleared security and customs. At the completion of this milestone, all the obstacles that could prevent a
passenger from making their flight were effectively removed. The only activity left was navigation to the boarding gate – an activity able to be controlled by the passenger. The removal of the final obstacle in the passenger journey resulted in the apparent reduction of passenger concern to a minimal level, as illustrated by the following segment from passenger 56:

I'm actually relaxed now... because there is nothing else procedurally to be done...
we've done everything, we've got our boarding passes... gone through security...
all we need is, you know, go down to the departure lounge... and we are done.

[PAX56]

It is important to note that it is only at this point, when the passengers have completed security/customs, and their concern has dropped to a negligible level, that the passengers were ready to engage in the “airport experience”. Until this last milestone is passed, the presence of the main concern prevents the passengers from becoming more than superficially involved in the offerings at the airport.

This observation is supported by the research findings of Livingstone et al (2013), who reported that landside (before security/customs) retail engagement was strongly correlated to the presence of wavers (non-flying family and friends), and was dominated by expenditures in “coffee” shop areas (Livingstone, et al., 2012). All other retail engagements were postponed until after the passengers cleared security and customs, when their primary concern of missing the flight was alleviated.

The way in which passengers engage in the airport environment is explored in more detail in field study two (Chapter 6).

**Prior knowledge as a mitigator for risk**

The fourth theme identified in the data analysis phase indicates that in addition to time, passengers also use prior knowledge and familiarity to reduce the uncertainty associated with navigating through the airport environment (Cave, Blackler, Popovic, & Kraal, 2013).

All passengers, irrespective of the frequency of their travel (frequent/not-frequent flyer) or the nature of their trip (business/holiday), arrived at the airport with a set
of expectations, or prior knowledge, about what their airport experience would entail (Harrison, et al., 2012). These expectations, or prior-knowledge about what to expect, were found to give passengers a sense of familiarity and control over their experience in the airport building. The utilisation of prior-knowledge to gain familiarity was found to be transferrable between airports – it was the general pattern of what happens in an airport that provided the feeling of control, rather than experience in a specific airport terminal, as illustrated by this segment from passenger 9:

...you know what you've got to do, where you've got to go, so ... [Is that because...there's something special about this airport?] No... because I travel... so I know where stuff is, I know where you have to be... I mean if it was someone new coming through, it may be a little daunting, but... but once you've done it once, or twice, then you really know what you've got to do... all airports are different... you get used to them after a while... [PAX09]

The general pattern of what passengers expect in the airport terminal is manifested through the re-enactment of personal routines, such as “I check-in, have a coffee, go to the bookstore, fill out my card, head to security”. These routines were observed to help passengers to feel a sense of familiarity despite the possible unfamiliarity of the (particular) airport environment. As an example, consider the following interview extracts from passengers 55 and 48:

I usually go through to security pretty quickly after checking in. I'll sit here with the passenger card, make sure no other emails come in and then I'll head straight through. [PAX55]

I'm going to get downstairs, get through, I'm going to make a phone call to our accommodations in New Zealand to verify a few things ... and then we're probably going to have a drink and sit around and wait for boarding time ... and before we get down there, I'll disappear to the bathroom and [my companion will] visit the bookstore. [PAX48]

In these examples, passenger 55 was a frequent traveller, making about 1 international trip per month from this particular airport. Passenger 48 and his companion, however, had not travelled from this airport before – their comfort was
provided through the prior-knowledge manifested in the familiar routine that they re-enacted when travelling internationally from other airports.

**Prior knowledge is transferred to group members**

A further theme found indicated that prior-knowledge is transferrable between group members travelling together. Furthermore, the baseline for expectations, or prior-knowledge, is set by the most experienced traveller in the group.

The following example from passenger 66 (translated by the participant’s Granddaughter), illustrates how transferred prior-knowledge is used by passengers to provide a sense of familiarity:

> She is travelling from Adelaide, back to India, via Brisbane... very happy and nice flying... [check-in] was good, no problem, very good. We had already checked in through Internet and just did the bag drop, and now we were just looking to get some Indian food for her to have. [PAX66]

Of note is that passenger 66 was an elderly lady, who was about to take her first international flight. The Granddaughter had checked her Grandmother in on-line and was directing her towards the security/customs area. Despite her age and lack of prior experience in flying, passenger 66 was observed to be very comfortable and relaxed in what constituted a completely unfamiliar environment. Passenger 66’s comfort was provided transitively through her Granddaughter, who herself was an experienced traveller.

In a more general case, it was observed that the prior knowledge of the most experienced member of the group became the baseline of knowledge for the group. The most experienced traveller took charge of the process which absolved the other members of the group from being individually worried or concerned about what had to be done next. This dynamic associated with the prior-knowledge of a group of travellers is illustrated by the following interview extract. Passenger 60 was a young adult, travelling for the first time with his young companion. The pair of travellers was accompanied at the airport by three additional wavers, one of whom was an experienced traveller:
[When will you head down to security?] When do we have to go? As soon as we have had our coffee? I don’t know... What is a good time?... [waver jumps in] I’d say in the next 15, 20 minutes or so. After they have had their coffee, they will go downstairs. [PAX60]

The above example illustrates that although the two young travellers were inexperienced, their apparent ease in the airport environment stemmed from prior-knowledge of the most experienced member of the group (in this case, a waver).

**Time as a threshold**

The sixth theme identified in the analysis of the interview data suggests that the current industry belief regarding how passengers relate to time may not be accurate. At present, terminal design and passenger satisfaction are believed to be strongly correlated to fast passenger processing, as measured in the order of minutes (ACRP, 2011; Correia, et al., 2008b; Harrison, et al., 2012).

Based on the participants interviewed, it was found that passengers did not think of their airport time in the order of minutes. Instead, a passenger’s airport time appeared to be measured by the successful completion of key milestones, and influenced by the quality of service obtained during the completion of the necessary activities associated with these milestones. For example, consider passenger 60’s recollection of check-in:

[Check-in was] ...fine, slow, but it was OK. Everyone was nice. [PAX60]

It is important to note that passenger 60 did not relate his check-in experience as a number of minutes, but rather by the label “slow”. Furthermore, in this example, there was no correlation between “slow” and passenger 60’s satisfaction with the check-in process.

Although passengers do not appear to think of their airport time in the order of minutes, there was evidence to suggest the presence of more coarse time “thresholds”. Passenger satisfaction appeared to be related to these time “threshold” being met, rather than the absolute number of minutes that had transpired.
In the airport setting that the interviews were conducted at, the time “thresholds” corresponded to a 50/50 conceptual partitioning of the total airport time between upstairs (check-in) and downstairs (security/customs and boarding). Thus, as long as check-in was completed within the first half of the passenger’s total airport time that day, the passenger appeared to be relatively satisfied with the check in process. The following passenger segments illustrate this notion (note that the recommended arrival time at Brisbane International is two hours prior to departure time):

I’ll probably send an email, grab a coffee before I go downstairs [through security/customs]... [And when would you start to think about going downstairs?] Probably after... about an hour before my flight. [PAX64]

I mean, if it’s over an hour, hour and a half [to check-in], that’d be horrendous. I’ve had that experience... that’s when it really gets to you. But lining up with a number of other people for 20-30 minutes is fine. [PAX53]

Although this was not directly evident from the participant interviews, it is plausible that the 50/50 time thresholds correspond to the two key milestones at which the risk of “Will I make my flight?” is reduced. It is likely that passengers allocate half of their total airport time to completing the first milestone (dropping off bags) and the second half of their time to clearing security and customs.

**Passengers expect waiting and queuing**

The seventh theme that emerged during the analysis phase emerged from an examination of the words that passengers use to describe time at the airport, in contrast to the words they use to describe other experiences.

In describing their airport experience, passengers generally used words associated with waiting and queuing, as illustrated in the following passenger segments:

*The line was probably... there were about 30 people in line... it took about 20 minutes. Not a big deal, just whatever... that’s just what happens when you get to the airport, I mean you go in line, waiting.* [PAX46]
Just checked in, and that was all good... just straight in, I was here early... No queues, straight in. I think the key is I got here early enough that I’ve avoided the queues. Queues are very stressful, I hate queues. [PAX07]

It was fine... it was good for me, I don’t like crowds and it was not crowded today... went through pretty quick today. [PAX08]

The language used by these passengers portrays a very time-oriented view of the airport experience. This is very different to the way in which passengers describe other aspects of their travel experience:

Lovely, just beautiful... we came through the scenic route, and the paths and turns, it’s like snakes... lovely. We haven’t seen any wildlife, have we? [PAX52]

The descriptive language used by passenger 52 in recounting their travels in Australia provides evidence to support that passengers think of their airport experience in a very time-specific way. This observation has two implications: firstly, as passengers expect that the airport is a “waiting place” (Harrison, 2013a; Harrison, et al., 2012), they are not necessarily adversely affected by the act of queuing itself. This further supports the theme that passengers think of their airport time in coarse thresholds and not in discrete minutes.

Secondly, the language used by the participants to describe their time at the airport suggest that passengers do not think of the airport as a destination, but a gateway to their desired destination. This was directly articulated by some participants, as illustrated in the segment from passenger 56:

The airport is just the port for us to travel by air, I suppose. So long as we get somewhere to wait... I mean the sinks are not wonderful, but it’s comfortable...

Yeah, the airport does not matter too much to us because it’s only a means to an end anyway. [PAX56]

The passenger perspective of the airport as a “waiting place” (Harrison, 2013a) appears to be misaligned with the perspective of many designers, who consider the airport terminal as an “experience destination” for passengers (Holm, 2012; Mayer, 2013; Nunes Madeira, 2012; Rowley & Slack, 1999). This gap is explored further in Chapters 6 and 7.
Past experiences are long lasting

The final theme that emerged from the data analysis showed that the duration of negative passenger experiences could be very long lasting. This theme was represented by participants through a reference to a past negative experience, followed by a variation of the phrase “...and as a result, I do not travel from that airport anymore”.

The following interview segment from passenger 54 illustrates this theme:

> We went to their airport years ago... and everything is in [foreign language].
> There's never anything in English. And to find simple little things is very difficult...
> It was the worst argument we've ever had in our marriage! It was awful... it was just horrible. We swore never ever ever to fly in and out of [said airport]. [PAX54]

It is important to note that these types of passenger stories will often outlive the “correction” of a problem at a particular airport. As an example, there are a lot of negative passenger experiences about Hartsfield-Jackson International Airport (ATL) on the SKYTRAX website (2011c). By virtue of still being accessible on the internet, these will continue to influence potential travellers, even though the problems raised have been rectified with the opening of a new terminal (Cardno, 2012).

In areas where passengers have a choice of airports to select from, for example, passengers flying from Australia to Europe have a choice of hubs in Asia and the Middle-East in which to make their journey transfer, the longevity of negative past experiences can eliminate certain airports from being considered. The net effect therefore, is that negative past experiences influence whether or not a passenger will travel through a specific airport in the future. The impact of the negative experience is of course magnified when amplified though social media and personal network channels (Carroll, 2012).

This theme provides support for the consideration and importance of the passenger as a profit affecting airport design stakeholder (Chapters 2 and 3).
5.3 Summary

Field study one was aimed at finding the relative influence of the four factors (service, time, environment and artefact) on the passengers’ experience in the airport terminal.

On the basis of field study one, the main factor of influence on the passenger experience was found to be time. The results indicated that the secondary factors (service, environment and artefacts) moderated, rather than influenced, the passenger’s subjective perception of time in the airport terminal.

The findings of field study one confirmed that there is a noticeable difference between the way that airports view the passenger experience, and the way that passengers view the airport experience. In particular, the results indicate that the Level of Service (LOS) metrics are an unsuitable measure of passenger experience or passenger satisfaction in the terminal building.

The relationship between passengers and their airport time emerged as fundamentally different than the objective, clock-based time relationship assumed in the LOS metrics. The analysis of the interview data revealed that passengers think of their airport time in terms of loose thresholds and the passage of milestones, rather than in terms of minutes elapsed.

The pre-conception of an airport as a place for waiting and queuing additionally acted as a moderator on the perception of time by passengers. Importantly, the presence of queues did not impact passenger satisfaction in the way that it is assumed to in the LOS metrics.

These findings challenge the LOS foundations on which current terminal design practice is based (IATA, 2004). At present, terminals are designed and evaluated under the assumption that passengers discriminate between minute-long time increments when queuing for processing in the terminal. Additionally, passengers generally considered that queues longer than 15 minutes were undesirable (ACRP, 2011). The results of this field study suggest that neither of these assumptions is true.
The outcomes of this field study suggested that passengers relate to their time at the airport, or engage in the airport environment, in different ways. The nature of these differences will be explored further in field study two (Chapter 6).
Chapter 6. Field Study Two - Modes of Passenger Engagement

This chapter presents the second of two field studies conducted as part of this research. Field study one found that time is the most influential factor in the passengers’ in-terminal experience. In field study two, the focus shifts towards examining the nature of the relationship between passengers and their airport time, with the goal of defining the various modes of passenger engagement in the airport terminal.

The current trend in terminal design, as described in Chapter 2 of this thesis, is based on two implicitly held assumptions:

1. Passengers are time-sensitive (as measured in the order of minutes), and
2. Passengers are motivated to engage in the airport environment.

The goal of field study two was to examine whether the above assumptions were true. As in field study one, the method of investigation was based on the augmented observation techniques, as described in Chapter 4.

The remainder of this chapter describes the field study two method, including participant recruitment and interview procedure, and presents the results. The chapter concludes with a new model for passenger segmentation.

6.1 Research method

The data collection instruments were verbal transcripts and researcher interview notes. The data for this field study were collected in-situ at Brisbane International Airport over a one year period (between February 2012 and 2013). In this time, 49 participants were interviewed. The participants were grouped according to their travel-companion groupings. This resulted in 16 separate passenger groups. Unlike field study one, each of the field study two interviews spanned the whole departure journey, from arrival in the terminal, through check-in, security and customs. The interview ended when the participant boarded the plane.
The interviews followed the same general pattern as for field study one (Appendix H), however, as they were significantly longer, they allowed the researcher to probe into various aspects of the passenger experience relayed by the participants. Care was taken to conduct the interviews in a consistent manner, and not to lead or bias the participant responses. As in field study one, the interviewer focussed on establishing rapport and providing a safe, non-judgmental environment for the participant to relay their experiences.

The participant interviews were recorded using AudioNote on an iPhone (Luminant Software Inc, 2013). Researcher notes and observations were recorded using AudioNote, allowing all comments to be time stamped and linked to participant interview data. All audio recordings and researcher notes were transcribed and imported into ATLAS.ti (2011). A total of 26:05:32 hours of interview data were collected, with an average interview time of 01:37:51 hours (Appendix I).

6.1.1 Coding scheme

The interview transcripts were analysed and coded according to four categories:

1. Time sensitivity
2. Degree of engagement
3. Proficiency of traveller
4. Purpose of travel

The coding scheme used is shown in Table 4. The code categories are described in the following sections.
Table 4: Coding scheme used for field study two

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time Sensitivity</strong></td>
<td></td>
</tr>
<tr>
<td>TIME SENSITIVE</td>
<td>The participant was sensitive to processing speed</td>
</tr>
<tr>
<td>NOT TIME SENSITIVE</td>
<td>The participant was not sensitive to processing speed</td>
</tr>
<tr>
<td><strong>Degree of Engagement</strong></td>
<td></td>
</tr>
<tr>
<td>ENGAGED</td>
<td>The participant engaged in the airport environment</td>
</tr>
<tr>
<td>NOT ENGAGED</td>
<td>The participant did not engage in the airport environment</td>
</tr>
<tr>
<td><strong>Traveller Proficiency</strong></td>
<td></td>
</tr>
<tr>
<td>PROFICIENT</td>
<td>The participant was comfortable in the airport environment</td>
</tr>
<tr>
<td>NOT PROFICIENT</td>
<td>The participant was unsure in the airport environment</td>
</tr>
<tr>
<td><strong>Purpose of Travel</strong></td>
<td></td>
</tr>
<tr>
<td>BUSINESS</td>
<td>The participant was travelling primarily for business</td>
</tr>
<tr>
<td>HOLIDAY</td>
<td>The participant was travelling primarily on holiday</td>
</tr>
</tbody>
</table>

**Time sensitivity**
The time sensitivity of a participant was based on the interview data and the researcher notes from the interview. A participant was considered time sensitive if he/she made reference to being bothered by queuing or waiting in the airport environment, being affected negatively by the speed at which processing was carried out, or mentioned the desire for faster, more efficient processing. The following interview segment illustrates time sensitivity of a participant:

“No, no, I would cut it very fine if I could. I would. I remember in the days before all this crazy security I would get to the plane just a minute or two before it was supposed to take off. I would cut it very fine ...by the time we leave our house, drive to the airport, unpack all the stuff at the parking lot, take the little trolley into the airport, check-in, go through the security, blah blah blah blah... door to door – we timed it one time just to see – for a 1 hour flight, it took us about 6.5 hours, all up, door to door... and it’s not entirely airport stuffing around, part of it is driving there, and whatever, but a lot of it, I mean at least 2-3 hours of that is messing around at the airport, just for a little domestic flight. [PAX15]

Note that for the above passenger, the focus on, and sensitivity to how long things take at the airport was independent of the purpose of travel – the passenger’s attitude did not change when travelling on holidays or on business.
On the other hand, participants that did not appear to be affected by queuing, waiting or processing delays were coded as not time sensitive. The following interview segment demonstrates a passenger with a relaxed, non time sensitive attitude to time in the airport terminal:

...we are creatures of habit... normally we will check-in early... we like lots of time... we get here about 4 hours before our flight... even when [my husband] is travelling alone for business, he still likes to get here that early... for me, I now like to be here 4 hours early just to get some kid-free time [laughs]... we usually get subway upstairs [landside], and after 2 hours we go downstairs [airside]... breaks it up a little... [PAX13]

**Degree of engagement**

The degree of engagement of a participant (engaged or not engaged) was based on an assessment of whether or not the participant engaged in the airport environment. For example, some participants explicitly stated their attitude to (non) engagement in the airport environment, as illustrated by the following passenger segment:

...I try to find a place to plug in my laptop and do some work... this is the norm for me... I never buy anything at the airport... not even food. [PAX01]

Other passengers did not overtly discuss their desire to engage or otherwise in the airport environment, it was something that was observed as part of the normal routine of the participant, as illustrated by the segment:

...we usually get subway upstairs [landside], and after 2 hours we go downstairs [airside]... breaks it up a little... the kids have a chance to run around a little... [PAX13]

**Traveller proficiency**

The proficiency of the traveller was assessed on the basis of whether or not the participant appeared comfortable in the airport environment. Participants who appeared generally comfortable in the airport setting, regardless of frequency of travel, were coded as proficient. Similarly, participants who were knowledgeable about the process they needed to go through were also categorised as proficient.
The level of comfort that passengers displayed in the airport environment did not appear to be related to the number of trips that they took each year. Additionally, the passenger’s perspective on what constituted “often” was quite variable. For some passengers, numerous monthly trips constitute often, while for others, a couple of (life time) trips mean the same thing. The following interview segments illustrate this variability:

[do you travel through this airport often?] Yeah, once or twice a month [PAX65]

[do you travel through this airport often?] Yes, [I have been here] a couple of times [to date] [PAX49]

Both passengers 65 and 49 appeared comfortable in the airport environment, despite the large difference in their frequency of travel. Consequently, traveller proficiency was assigned on the basis of apparent comfort in the airport environment, rather than the number of flights taken per year, or the participant’s frequent flyer status.

The participants who did not appear comfortable, or who were in general apprehensive or unsure about the processes that they had to undertake in the terminal, were coded as not proficient.

**Purpose of travel**

The purpose of travel was coded as either business or holiday. The participants were directly asked the question “Are you travelling for business or leisure?” and their responses were recorded. The purpose of travel was recorded in order allow the results of this research to be compared to existing works: this segmentation has been commonly used in the literature (Correia, et al., 2008b; Fodness & Murray, 2007; Shaw, 2007).

### 6.1.2 Data coding process

The processes of coding and analysis were based on thematic analysis techniques (Bauer & Gaskell, 2000; Boyatzis, 1998; Flick, 2009). The interview transcripts were analysed by the researcher and coded according to the coding scheme described in the previous section. The coding was validated by the same researcher six months
after the initial coding phase was completed (December 2013). The validation included re-coding a randomly selected subset of the interview transcripts (50%). No significant differences in coding were discovered.

The coding was carried out using Atlas.ti software (2011). The process involved importing the interview transcripts, analysing the text and assigning an appropriate code (Table 4) to each transcript. An example of a coded interview transcript is shown in Appendix K.

6.1.3 Triangulation of results
In order to strengthen and generalise the validity of the findings, the results from field study two were triangulated against the field study one data. Triangulation is often used in qualitative research to enhance the confidence of findings, especially in the context of research conducted on smaller sample sets (Denzin & Lincoln, 1994, 2003; Flick, 2009). The technique of data triangulation is based on the notion that a proposition gains strength if it can be confirmed from more than one source (Denzin & Lincoln, 2003). Thus, an outcome observed in two independently collected data sets or channels is stronger than an outcome observed in only one data set. In this way, triangulation is used as a method to increase research rigour and the theoretical generalizability of outcomes from a study (Flick, 2009; Gomez, 2012).

The field study one and field study two data sets were collected at the same location, Brisbane International Terminal. Field study one corresponded to a larger number of shorter interviews (66), while field study two represented a smaller number of in-depth interviews (16). The data sets were collected independently of each other, making them suitable for the triangulation of outcomes.

The data set from field study one was re-coded using the coding scheme developed for field study two (Table 4). A comparison of the results from the two field studies is presented in the analysis and results (Section 6.2).
6.1.4 Participant demographics

In total, 49 participants were interviewed in field study two. Of the 49 participants, 72% were travelling on holiday, 18% were travelling on business and the remaining 10% were non-travelling companions, or wavers. The detailed demographics for field study two participants are shown in Appendix I.

Of the participants recruited for field study two, 44% made use of the airline lounge facilities at the airport. In comparison, in field study one there were no participants who made use of the airline lounge facilities. A further observation was that all the participants (100%) were experienced travellers. This was true even for school age children travelling on a school ski vacation. These young travellers were observed to be comfortable and familiar with the airport terminal environment. The potential impacts of these demographics were considered in the analysis phase of this field study.

Recruitment of participants was done primarily using the researcher’s social media networks. The researcher placed a field study information page on the internet, and advertised the project via Facebook and email channels (Appendix F). The only criterion for participant selection was upcoming international travel, with departure from the Brisbane International Terminal.

Interested participants contacted the researcher via email, and were briefed on the study and asked to sign the release form (Appendices G and H) before taking part in the research. On the day of travel, the participants were met at the entrance to the departures level of Brisbane International Terminal, at a time of their choosing (i.e. the researcher did not specify what time the participant should be at the airport). The interview began at this time, and concluded when the participants boarded their flight.

Comparison against the triangulation data set

The composition of participants in the two field studies was very similar. The percentage of business/holiday travellers was reflective of the breakdown of travellers for Australia in general: 15% business and 85% holiday (Australian Bureau of Statistics, 2012).
The main difference between the two data sets was the use of the airline lounge facilities (44% of field study two participants compared to 0% of field study one participants used airline lounge facilities). The second difference observed between the two data sets was the level of proficiency of the travellers: 100% of the field study two participants were proficient travellers, compared to 40% of field study one participants. The impact of degree of traveller proficiency on passenger engagement is examined in the analysis of field study two results.

6.2 Analysis and results
This section outlines how the collected interview data were analysed, including results from the analysis.

6.2.1 Primary results

Time sensitivity
In the field study two data set, 19% of participants were found to be time sensitive. In comparison, 15% of field study one participants were found to be time sensitive (Figure 26). The difference between field study one and field study two results was small enough (4%) to suggest that on average, 17% of participants were found to be time sensitive.

![Figure 26: Time sensitivity of participants](image)

Degree of engagement
The degree of participant engagement was also close in the two data sets (Figure 27). In field study two, 31% of participants were found to actively engage in the
airport environment. In field study one, the proportion was only slightly higher (38%). On average, the degree of engagement of participants was 35%.

![Figure 27: Degree of participant engagement](image)

The two data sets had similar levels of participant engagement, despite the large difference in the number of airline lounge users: in field study two, 44% of participants used the lounge facilities compared to 0% in field study one. This result suggests that there is no link between the use of an airline lounge and the degree of passenger engagement in the airport environment.

**Traveller proficiency**

Examining the results from the perspective of the time proficiency of the traveller, 100% of field study two participants were proficient, as compared to only 40% of field study one participants (Figure 28). This corresponded to an average of 80% traveller proficiency.

![Figure 28: Traveller proficiency](image)
The variation in traveller proficiency between the two data sets likely reflects the method used to recruit participants for each of the two field studies. In field study two, participants were pre-selected before the date of travel. As can be expected, only those who felt comfortable with the travel process volunteered to take part in this type of research. This observation can be anecdotally confirmed: one of the participants agreed to take part in the research, however, at the interview start the participant looked very unsure and uncomfortable. The participant proceeded to pull out of the research, citing nervousness in the airport environment as their reason for the change of mind.

The field study one participants, on the other hand, were opportunistically selected from people who happened to be travelling on the interview days (and not using the airline lounge facilities). As a result, this set of participants represented a wider cross-section of international travellers, and hence, displayed more range in traveller proficiency.

**Purpose of travel**

The purpose of travel varied by 14% between the two data sets: in field study two, 38% of participants were travelling on business, while only 24% of field study one participants were making a business trip (Figure 29). On average, 31% of participants were travelling on business.

![Figure 29: Purpose of participant travel](image)

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6.2.2 Derived relationships

In this section, the results from field study two are examined from the perspective of each of the factors that were coded: time sensitivity, degree of engagement, traveller proficiency and purpose of travel. The results are triangulated against the data set from field study one.

Impact of time sensitivity

Of the total participants, only 19% of field study two and 15% of field study one participants were found to be time sensitive (Figure 26). Of these, almost all were proficient, with the majority travelling for business. None of the time sensitive participants in either field study were found to engage in the airport environment. These results are shown in Figure 30.

![Figure 30: Impact of time sensitivity on the passenger experience](image)

In field study two, 100% of the time-sensitive participants were found to be proficient travellers. Triangulating this result with the field study one data set produced a very similar result (90%). These results suggest that there is a strong relationship between time sensitivity and passenger proficiency, i.e. almost all time sensitive participants are proficient travellers. Note, however, that not all proficient travellers were found to be time sensitive (Figure 34).

Of the time sensitive participants, none (0%) were found to engage in the airport environment. This result was discovered in the field study two data, and confirmed in the field study one data. The correspondence between these results implies the presence of an inverse relationship between time sensitivity and engagement. In other words, no time sensitive participants engage in the airport environment.
Interestingly, the converse relationship also holds true, i.e. no engaged participants are time sensitive (Figure 32).

Looking at Figure 30 again, the majority of time-sensitive participants were passengers travelling on business (67% of field study two and 50% of field study one participants). Given the relationship between time sensitivity and engagement, it is possible to infer that business travellers are unlikely to engage in the retail environment while in the airport terminal. This result could have significant implications on the design of terminals. In particular, airports which cater predominantly to the business traveller may need to re-consider retail expansion strategies.

From the perspective of participants who were not time sensitive (Figure 31), the results indicate that the majority of them were proficient (100% for field study two and 55% for field study one).

The levels of engagement were also fairly close for the two data sets: 38% of field study two, and 45% of field study one participants who were not time sensitive engaged in the airport environment.

![Figure 31: Impact of non time sensitivity on the passenger experience](image)

Less than one third of non time sensitive participants were travelling on business (31% for field study two data, and 20% for field study one data). This confirms the generally held belief that holiday travellers are less time sensitive than business travellers (Persson, 2013; Tarbuck, 2012a).
Impact of engagement

Overall, approximately one third of passengers were found to engage in the airport environment. For field study two, 31% of all participants engaged in the airport environment. This figure was slightly higher for field study one participants (38%), as shown in Figure 27. Of the passengers that did engage in the airport environment, the majority were found to be proficient travellers who were going on holidays. None of the engaged participants were found to be time sensitive (Figure 32).

Of the participants who engaged in the airport environment, none were found to be time sensitive. As discussed in the previous section, this inverse relationship between time sensitivity and engagement may have important terminal design implications.

In field study two, all of the engaged participants were proficient travellers (100%). In the field study one data set, 56% of engaged participants were found to be proficient travellers.

Examining the purpose of travel, in field study two, 20% of the engaged participants were travelling for business, and in field study one the figure was 24%. From this, it is possible to infer that only about a fifth of all engaged travellers were travelling on business, or, more importantly, that the vast majority of engaged travellers were travelling for leisure.

Looking at the data from the perspective of non-engaged participants (Figure 33), the results indicate that 27% of non-engaged participants were time sensitive in the
field study two data set. This figure links closely to the result from the field study one data set (24%). In other words, although there is a direct relationship between time sensitivity and engagement (Figure 32), the inverse relationship is not as strong, i.e. non-engagement does not necessarily imply non-time sensitivity in a passenger.

![Graph](image)

Figure 33: Impact of non-engagement on the passenger experience

All of the field study two participants were proficient, hence the not engaged proficient travellers corresponded to 100% in this data set. In the field study one data set, this figure was still high (63%). This result suggests that there may be an inverse relationship between the level of engagement and the proficiency of the passenger, i.e. as travellers gain proficiency, their level of engagement in the airport environment decreases.

Of the not engaged participants, 45% were travelling on business in field study two and 24% were travelling on business in field study one. Therefore, 55% (field study two) and 76% (field study one) of participants were travelling on holiday. This result suggests that the majority of holiday travellers do not engage in the airport environment. This result runs against the more commonly held belief that holiday travellers have a preference for engaging in the airport environment (Persson, 2013; Tarbuck, 2012a).

**Impact of traveller proficiency**

In field study two, 100% of participants were proficient travellers, compared to only 40% of the total field study one participants (Figure 28). The results between field study two and field study one showed that the proportion of proficient travellers
who were time sensitive was 63% and 23% respectively (Figure 34). One third of proficient travellers engaged in the airport environment (31% for field study two and 35% for field study one) and one third were travelling on business (38% for field study two and 33% for field study one).

![Figure 34: Impact of traveller proficiency on the passenger experience](image)

Although the variation in time sensitivity of the proficient travellers was large (63% vs 23%), there was similarity in the ratio of proficient to time sensitive travellers in the two data sets. In field study two, 63% of the total 100% (i.e. 63%) of proficient travellers were time sensitive. In field study one, 23% of a total 40% (i.e. 58%) of proficient travellers were time sensitive. In other words, the two data sets provide support for the existence of a strong link between time sensitivity and traveller proficiency. This result will be explored in more detail in Chapter 8.

The degree of engagement between the two data sets was also reasonably close. In field study two, 31% of proficient travellers were found to engage in the airport environment. In field study one, 35% of participants engaged in the airport environment. Again, the small variance between the two data sets implies that about one third of proficient travellers engage in the airport environment.

The results for the purpose of travel were also relatively close in the two data sets. Triangulation with field study one data set showed that 33% of proficient travellers were travelling on business, compared to 38% in the field study two data set. Although the proportion of business travellers who are proficient is higher than the proportion of holiday makers who are proficient, the majority (62-67%) of proficient travellers are holiday makers, not business travellers.
Looking at the data from the perspective of non-proficient travellers, showed that there were no non-proficient travellers in the field study two data set (Figure 35). The proficiency of the field study two passengers is a likely consequence of the method that was used to recruit participants (as described in section 6.1.4), i.e. the field study two participants were pre-selected, while the field study one participants were opportunistically selected on their day of travel.

Figure 35: Impact of non-traveller proficiency on the passenger experience

In the field study one data set, a very small percentage (4%) of non-proficient participants were time sensitive. This indicates the presence of a relationship between proficiency and time sensitivity, i.e. less proficient travellers tend to be less time sensitive.

The degree of engagement of the non-proficient participants in field study one was 42%. A small proportion of non-proficient travellers in this data set (12%) were travelling on business, i.e. 88% of non-proficient travellers were holiday makers.

**Impact of purpose of travel**

Less than half of the field study two participants (38%), as well as field study one participants (25%) were travelling on business (Figure 29). Of these travellers, approximately a third were found to be time sensitive (33% for field study two and 31% for field study one), a large proportion were proficient (100% and 81% respectively) and only a relatively small percentage were engaged in the airport environment (17% and 38% respectively) (Figure 36).
In field study two, 33% of business travellers were found to be time sensitive. This proportion was almost the same in the field study one data set (31%). This result indicates that about two-thirds of business travellers are not time sensitive, indicating that the currently held industry belief that business travellers are predominantly focussed on processing speed may be invalid (as discussed in Chapters 2 and 3).

The majority of participants travelling on business were found to be proficient travellers (100% in the field study two data set; 90% in the field study one data set).

The degree of engagement for the business participants varied between the two data sets. In field study two, only 17% of business travellers were engaged in the airport environment, compared with 38% in the field study one data set.

Examining the data from the perspective of holiday travellers, who accounted for the majority of all participants (Figure 29), it was found that a very small proportion of holiday travellers were time sensitive (10% in both field study one and field study two), as shown in Figure 37. This result confirms the currently held industry beliefs that holiday travellers in general have a more carefree attitude to time in the airport (Persson, 2013; Tarbuck, 2012a).

In field study two, all the participants were proficient travellers (100%). In the field study one data set, 54% of holiday travellers were found to be proficient.
The degree of engagement between the field study two data set and field study one data set was almost the same, 40% and 38% respectively. This result is interesting when compared to the business traveller engagement results shown in Figure 36. In the field study two data set, the degree of engagement of business travellers (17%) was approximately half that of the holiday travellers (40%).

6.3 Relationship between time sensitivity and degree of engagement

In this section, the relationship between time sensitivity and degree of engagement is discussed in further detail. Recall from the coding scheme (Table 4) that degree of engagement was coded as two possible options (engaged or not-engaged), and similarly, time sensitivity was coded as two options (time sensitive or not time sensitive). It follows therefore that the complete relationship between time sensitivity and degree of engagement can be enumerated as four possible relationship states:

1. Engaged and time sensitive
2. Engaged and not time sensitive
3. Not engaged and time sensitive
4. Not engaged and not time sensitive

From the results in the previous section, it was discovered that the first relationship stated in the above list (engaged and time sensitive) corresponded to 0% of the participants in both the field study two and field study one data sets (Figure 30 and Figure 32). Given the totality of the relationship, and the triangulation of the result
against two independent data sets, there is strong support for the validity and generalizability of this relationship.

In the remaining three relationship states, the results for field study two and field study one were within a 7% range of each other. This again suggests strong support for the reliability of the findings. Taking the average of the two data sets, 35% of participants were engaged and not time sensitive; 17% were not engaged but time sensitive and 48% were not engaged and not time sensitive. These results are shown in the matrix in Figure 38.

![Figure 38: The relationship between passenger time sensitivity and engagement](image)

The significance of these results from a terminal design perspective will be discussed in Chapter 8. In the remainder of this section, a new approach to passenger segmentation is introduced based on each of the four quadrants in Figure 38.

6.3.1 A new model for passenger segmentation

In this section, the outcomes of this field study are used to develop a new model for passenger segmentation (Harrison, Popovic, & Kraal, 2015). The model is based on the four modes of engagement derived from the relationship between time sensitivity and degree of engagement (Figure 38). Each of the quadrants in the matrix in Figure 38 represents a separate passenger segment, as shown in Figure
39. A description of the characteristics of each of these passenger segments is derived from the qualitative interview data. Each segment is described in the following sections.

![Segmentation based on the four modes of passenger engagement](image)

**Airport Enthusiast**

The Airport Enthusiast category represents the sub-group of passengers who are engaged in the airport environment and are not overly time sensitive. The airport enthusiasts have a very positive attitude towards their time at the airport: they enjoy their airport time, and are willing to engage in the experience offerings provided to them. For these passengers, the airport is the start of their holiday or business trip.

The Airport Enthusiasts have the most elastic range of acceptable processing speeds and are not particularly affected by queuing or waiting. Their general attitude is very carefree.

Given that passenger engagement in the airport environment is a pre-cursor to retail spending (Livingstone, 2014), the airport enthusiasts represent the highest yield category of passengers – they actively engage in and enjoy shopping, and come to the airport ready to spend.
The following passenger quotes reflect the attitude of the airport enthusiasts:

\[
I \text{ think there should be more shops [at this airport]}\ldots \text{ when I go to the airport I shop. I can go to airport early and still go around airport and shop. [PAX02]}
\]

\[
...\text{definitely a pleasant experience. Always a pleasant experience... we spend probably on average an hour at the airport- just chilling around... we always need to do some shopping or collect some duty free. [PAX07]}
\]

**Time Filler**
The Time Filler category of passengers represents the passengers who do not engage in the airport environment, and are also not very sensitive to time. These passengers consider their airport time a “write-off”, or a complete waste of time. In their estimation, time at the airport is an undesirable overhead of travel – how they spend it, whether it is queuing or sitting, is inconsequential.

Due to their low level of engagement, and their tolerance for queuing, the Time Fillers represent the lowest yield category of passengers: they take up airport space, yet do not spend.

The following extracts represent the general attitude of the Time Filler passengers:

\[
...\text{wait around here until time runs out, and then walk down to the other end, and just sit and wait. [PAX12]}
\]

\[
\text{Killing some time, checking in then going through... [PAX06]}
\]

\[
\text{The airport is just the port for us to travel by air... So long as we get somewhere to wait... yeah, the airport does not matter too much to us because it's only a means to an end anyway... It would be very rare for us to buy anything in an airport. Maybe a cup of tea... they are just disconnected from the rest of the world, the shops in the airport... and it's the same in every airport, it does not matter where you are, even in India, or Nepal... does not matter what country you are in, the airports are the same [PAX11]}
\]

**Efficiency Lover**
The Efficiency Lovers are the category of passengers who are sensitive to time, and do not engage in the airport environment. These passengers feel inconvenienced by inefficiencies of any kind, even when they are not in danger of missing their flight.
These passengers become easily frustrated and show a very low tolerance for queuing.

In the instances where efficiency lovers are making use of airline lounge facilities, their low tolerance for queuing and waiting can be masked by the efficiencies afforded to them through priority check-in and faster passage through security/customs. In other words, they may appear not sensitive to time, but that is only because they are being processed efficiently.

The following interview extracts illustrate both the appreciation of efficiency and the lack of interest in airport engagement for the Efficiency Lover passengers:

*What I normally do... go directly through security... I wander around for a moment and figure out how is this particular airport laid out, and... what is the most efficient way to get through here... I hate queuing and waiting... [PAX15]*

*... I knock off probably about 45 minutes for an international flight... my flight leaves at 6am, so I can sleep in until about 4:30am, otherwise I’d have to wake up around 3:00am. So instead of waking up around 3:00am, I can wake up at 4:30am. It’s just that extra hour of sleep, and you don’t have to wait in line. [PAX09]*

*I never buy anything at the airport... it would be very rare, unless I forgot a charger for my laptop or something... if I could get here an hour later, I would... for sure [PAX01]*

**Efficient Enthusiast**

The final category of passengers, those that are sensitive to time and engage in the airport environment, represent the passenger group which is currently targeted by airport designers (de Neufville & Odoni, 2003; Hehir, 2012).

In practice, none of the passengers interviewed displayed the characteristics of this target group: both high sensitivity to efficient processing and a desire to engage in the airport environment.

**6.4 Summary**

At present, the general terminal design philosophy is based on the assumption that passengers are time sensitive (as measured in the order of minutes) and willingly
engage in the airport environment (de Groof, 2012; Griffith-Jones, 2012; IATA, 2004). Field study two was aimed at exploring whether these two assumptions held true from the perspective of the passengers’ airport experience.

The data for field study two were collected from in-depth interviews with 49 participants conducted at Brisbane International Terminal (2012-2013). The results were triangulated against data from field study one (150 participants). The triangulation process supported the validity of the results of field study two.

The field study two interviews were analysed from the perspective of participant time sensitivity, degree of engagement in the airport environment, traveller proficiency and purpose of travel. The results of this analysis indicated that the relationship between time sensitivity and degree of passenger engagement was important in its characterisation of the passenger experience in the airport environment.

The relationship between time sensitivity and passenger engagement was deconstructed into a matrix of possible permutations of engaged/not engaged and time sensitive/not time sensitive. The results produced four modes of passenger engagement, which were qualitatively described as: Airport Enthusiast (engaged, not time sensitive); Time Filler (not engaged, not time sensitive); Efficiency Lover (not engaged, time sensitive) and Efficient Enthusiast (engaged, time sensitive) (Harrison, et al., 2015).

According to the outcomes of this field study, the current target passenger for global terminal design, described in this field study as the efficient enthusiast, was an empty passenger segment. This suggests that airports are currently being designed for the wrong target customer. On the basis of lessons from other fields of design, there is strong evidence to suggest that design that does not meet the needs of the customer is not a profit inducing business strategy (Gallo, 2010; Pine & Gilmore, 2011). It is possible that the misaligned terminal design strategy may be a factor in contributing to the low profit margins in the aviation industry in the last several decades (IATA, 2013b).
The implications of these findings on terminal design are discussed in Chapter 8. Chapter 7 consolidates the results from field study two with the results of field study one, in order to validate and extend the conceptual model of passenger experience introduced in Chapter 3.
Chapter 7. A Model of Passenger Experience

The conceptual model described in this chapter validates and extends the conceptual model introduced in Chapter 3 (Figure 19) with the factors of experience influence (field study one) and the modes of passenger engagement (field study two). The conceptual model describes the behaviour of passengers in the airport environment, i.e. it describes the factors that influence the passenger experience in the airport terminal.

The model provides a framework for understanding passenger experience in the airport environment. Together with the underlying mathematical equations (Appendix M), the model constitutes a specification for a tool that may be used to assist airport planners and designers with making decisions related to the experiences of passengers. The discussion section at the end of the chapter discusses how the conceptual model can be used in terminal design and planning.

7.1 Extensions to model based on research outcomes

The outcomes of the two field studies provide new insights into the factors of experience influence and passenger modes of engagement in an airport terminal. In this section, the results from field study one and two will be used to extend each of the passenger experience types introduced in the model in Chapter 3.

The new conceptual model, annotated with the extended descriptions for each of the experience types, is shown in Figure 40. Each experience type is described in detail in the following sections using the graphical representation introduced in Chapter 3 (Figure 11). The mathematical relationships that underpin each model in this chapter are presented in Appendix M.
7.1.1 Objective airport perspective

Staged experience
Staged experience represents the airport operator’s perspective of passenger experience. This type of passenger experience is objectively measured through the industry Level of Service (LOS) metrics (Chapter 2).

The two field studies did not investigate the passenger experience from the airport operator’s perspective. For this reason, the description of staged experience remains as described in Chapter 3 (Figure 13), i.e.

*Staged Experience is a function of the objective measure of SPACE, objective (clock) TIME and the PROCESS that a passenger is experiencing (check-in, security, customs, boarding).*

7.1.2 Subjective passenger perspective

Public experience
The collection of public passenger experiences, retold through word of mouth, social media channels and other networks, contribute to the concept that each
passenger has about a particular airport (Chapter 5). In particular, in field study one it was found that passengers hold on to their notions of an airport for very long periods of time, and ultimately affect whether or not the passenger will travel from a given airport (Chapter 5).

The model of public experience (Figure 14) augmented with the results from field study one can be expressed as:

*Public Experience ultimately defines whether or not a passenger will choose to travel (from a selected airport).*

The relationship between Public Experience and the values WILL TRAVEL or WILL NOT TRAVEL can be represented as shown in Figure 41.

![Figure 41: Public Experience](image)

In Figure 41, WILL TRAVEL and WILL NOT TRAVEL represents a Boolean value (true or false) indicating whether the passenger will or will not travel from a given airport (based on the collective opinion of other travellers).

The expression of Public Experience (Figure 41) highlights why airports need to, and are, placing increasing importance on passenger satisfaction (Chapter 1). Ultimately, public opinion affects whether or not a passenger will travel from a given airport. As indicated by the results from field study one, these opinions can be
very long lasting, sometimes outliving the actual reasons for passenger dissatisfaction (Chapter 5).

**Past experience**

A passenger’s past experience, gained directly through their own travels, or indirectly through public experience, can be expressed as an uncertainty factor that the passenger associates with travel from a given airport (Chapter 5).

This uncertainty factor is an amount of time that the passenger uses to offset the airport’s recommended arrival time when they travel from a given airport. The uncertainty factor can be positive or negative, and is allocated by the passenger to ensure that the goal of making the flight will be met (Chapter 5).

The model of past experience (Figure 15) augmented with the results from field study one can be expressed as:

*Past Experience ultimately defines an amount of time, the UNCERTAINTY FACTOR, which a passenger uses to moderate the recommended arrival time at a given airport.*

The relationship between Past Experience and the value UNCERTAINTY FACTOR can be represented as shown in Figure 42.
In Figure 42, UNCERTAINTY FACTOR is a value representing the time (positive or negative) that the passenger applies to offset the recommended airport arrival time when travelling from a given airport.

**Expected experience**
The passenger’s expected experience in the terminal building can be expressed as a function of their past experience, the actual or staged experience they are presented with, and a measure of their perception of whether or not they will miss their flight (Chapter 5).

The passenger’s interpretation of the probability that they will miss their flight diminishes as the passenger completes key milestones in the departure process. This probability is formed dynamically from an evaluation of where the passenger is in the processing journey in relation to their surroundings (staged experience) at that point in time.

The expected experience of a passenger is moderated by the relationship that a passenger has with their airport time (Chapter 5). From field study two (Chapter 6), the relationship between the passenger and their airport time, illustrated in Figure 39 as four segments, can be expressed as:

*The relationship between the Level of Engagement (ENGAGED or NOT ENGAGED) and Time Sensitivity (SENSITIVE or NOT SENSITIVE) of a passenger can be used to define four distinct Passenger Segments.*

The relationship between Passenger Segment, Level of Engagement and Time Sensitivity can be represented as shown in Figure 43.
In Figure 43, LEVEL OF ENGAGEMENT represents a Boolean value (true or false) (ENGAGED or NOT ENGAGED) indicating whether the passenger is engaged or not engaged in the airport environment, and TIME SENSITIVITY represents Boolean value (true or false) indicating whether the passenger is or is not sensitive to time in the airport environment (SENSITIVE or NOT SENSITIVE).

Incorporating the model for Passenger Segment into the model of expected experience (Figure 16) can be expressed as:

\[ \text{Expected Experience is a function of the characteristics of the Passenger Segment that the passenger belongs to, their PAST EXPERIENCE, the objective STAGED EXPERIENCE and the passenger’s assessment as to whether or not they will MAKE (their) FLIGHT, at a given point in time.} \]

The relationship between Expected Experience and PASSENGER SEGMENT, PAST EXPERIENCE, STAGED EXPERIENCE and MAKE FLIGHT can be represented as shown in Figure 44.
In Figure 44, PASSENGER SEGMENT is the mode of passenger engagement, or manner of interaction, in the airport environment (Figure 43), PAST EXPERIENCE is the past experience of the passenger (Figure 42), STAGED EXPERIENCE is the objective experience offering (Figure 13) and MAKE FLIGHT represents a Boolean value (true or false) indicating whether or not the passenger feels that they will (or will not) make their flight.

**Perceived experience**

A passenger’s perceived experience was found to be a reflection of whether or not they felt that they were likely to miss their flight, as measured at a particular point in the passenger’s departure journey (Chapter 5).

The perceived measure of whether or not the passenger would miss their flight was based primarily on the passenger’s subjective interpretation of time (Chapter 5). This subjective interpretation of time was affected by the passenger’s perceptions of service, environment and artefacts. The interpretation of time in the airport building was also found to be moderated by the passengers’ expectation of queuing and waiting.

The passenger’s subjective interpretation of time, as derived from the results of field study one, can be expressed as:
A passenger’s subjective interpretation of time is a function of their interaction with ARTEFACTS, the SERVICE experienced, the airport ENVIRONMENT as well as the objective elapsed TIME, as moderated by the passenger’s expectations that the airport is a WAITING PLACE.

The relationship between TIME (subjective) and ARTEFACT, SERVICE, ENVIRONMENT, TIME (objective) and WAITING PLACE can be represented as shown in Figure 45.

![Figure 45: Subjective Time](image)

In Figure 45, ARTEFACT is the effect of interacting with artefacts on the perception of time, SERVICE is the effect of service on the perception of time, ENVIRONMENT is the effect of the environment on the perception of time, TIME (objective) is an objective measure of time in minutes (Figure 8), and WAITING PLACE is a value which moderates the perception of TIME (objective) by the passenger’s expectations that the airport is a place for waiting (and queuing).

The subjective interpretation of time by passengers was related to the achievement of key milestones in the departure journey. At each of the key milestones (bag drop and clearing security/customs), passengers were found to have a perception about whether or not they were likely to miss their flight. This perception is formed dynamically from an evaluation of where the passenger is in the processing journey in relation to their surroundings (staged experience) at that point in time.
The perceived experience of a passenger can be expressed as:

Perceived Experience is a function of the characteristics of the Passenger Segment that the passenger belongs to, the passenger’s subjective interpretation of TIME, and the passenger’s assessment as to whether or not they will MAKE (their) FLIGHT, at a given point in time.

The relationship between Perceived Experience, Passenger Segment, TIME (subjective) and MAKE FLIGHT can be represented as shown in Figure 46.

![Figure 46: Perceived Experience](image)

In Figure 46, Passenger Segment is the mode of passenger engagement, or manner of interaction, in the airport environment (Figure 43), TIME (subjective) is the passenger’s interpretation of time (Figure 45), and MAKE FLIGHT represents a Boolean value (true or false) indicating whether or not the passenger feels that they will make their flight.

**Satisfaction**

The two field studies did not investigate the derivation of passenger satisfaction. As such, the description of satisfaction remains unchanged (Figure 18).

**7.2 Discussion**

The conceptual model presented in this section provides a framework that describes passenger experience in the airport environment. In the model, the
explicit separation of the objective airport-centric and subjective passenger-centric perspectives of experience highlight that the passenger experience should not be evaluated from an operational perspective. This result represents a major departure from the way that passenger experience is understood, measured and evaluated in both academic and industry sectors (ACRP, 2011; de Neufville & Odoni, 2003; IATA, 2004, 2013c). In particular, the model highlights that the Level of Service metrics (LOS) are an inappropriate measure of satisfaction or service quality from a passenger perspective (Correia, et al., 2008a; Fodness & Murray, 2007; Gilbert & Wong, 2003; Subha, Bina, & Archana, 2012; Zidarova & Zografos, 2011).

Looking at the individual formalised definitions of each of the five experience types, as summarised in Figure 40, provides a framework that can be used by airport planners to understand passenger behaviour, and the factors that influence it. For example, the collective importance of passenger experience is clearly articulated through the definition of public experience (passenger will or will not travel from an airport), as is the direct relationship between passenger satisfaction and the likelihood of future travel from a given airport. Similarly, the past experiences, both direct and indirect, of a passenger culminate to form an uncertainty factor that is applied when the passenger travels from an airport. From a terminal design and planning perspective, these findings could indicate that a passenger’s future travel plans are very coarse grained (either a passenger will or will not travel from an airport) and not focussed on factors that are currently thought to influence travel choices, such as aesthetics, washroom facilities, choices of retail offerings (JD Power, 2011; SKYTRAX, 2011c).

The formalisation of expected and perceived experience draws attention to the importance of alleviating passengers’ fears as early as possible in the departures journey. At any point in this journey, from check-in, through security/customs and right up until the boarding gate, the passenger is influenced by their interpretation of whether or not they will make their flight. As long as this fear, or likelihood of missing the flight, remains high, the passenger is less likely to engage in the airport environment. The clear articulation of this factor’s impact on the passenger experience suggests that airport retail offerings should be placed after the
passengers’ fears are reduced to a negligible level. This result is supported by the findings of Livingstone (2014) and Kirk (2013), however, is not yet a commonly adopted principle in terminal design practice (Goto, 2013b; Hehir, 2012; Kolatorski, 2012; Tarbuck, 2012b).

The conceptual model of passenger experience can also be used as a tool for the evaluation of alternate passenger oriented initiatives. As each of the factors of influence are articulated in the model, the effects of different initiatives can be decomposed and mapped to these factors, thus reducing the amount of “trial and error” associated with a new initiative (Ramsden, 2013).

As an example, consider the current industry trend of passenger “app” creation (Agrawal, 2012; Copart, 2013a). These airport apps are, at a high level, all very similar: they provide real time flight status updates, airport information, retail offers, wayfinding information and/or security queue wait times to passengers (Agrawal, 2012; Mayer, 2012; Tarbuck, 2012a). However, not all of the initiatives have been equally successful with passengers. Using the conceptual model, a potential passenger app can be refined at the specification phase.

The definitions of expected and perceived experience can also be used to direct the development of specifications for a potential app. Features in the app should be related to primarily reducing the passenger’s fear of missing the flight. Only when that is achieved, is there any sense in seducing the passenger with retail or other offers to spend in the terminal.

The conceptual model can also help airport operators in determining the most effective allocation of human resources within the terminal. Once again, staff should be trained and targeted towards the management of passenger expectations and perceptions, especially during exceptional or extraordinary events such as weather or flight delays. It has been noted that modern consumers, including passengers, value information transparency (ACRP, 2011; Norman, 2009; Pine & Gilmore, 1999). In fact, Norman (2009) has demonstrated that even in the face of service breakdown, customers’ expectations can be re-set through transparency of information: alerting passengers to the reasons for a flight delay.
can result in positive customer satisfaction, in spite of their original expectations not being met.

Finally, the conceptual model, and in particular the elements of expected and perceived experience characterised by the relationship between passenger engagement and time sensitivity of passengers, can be used to optimise the allocation of space in the terminal building (Chapter 8).

7.3 Summary
In this chapter, the conceptual model introduced in Chapter 3 was extended with the findings from field study one and two (Chapters 5 and 6). The mathematical relationships that underpin the conceptual model are shown in Appendix M.

The outcomes of field studies one and two confirmed that there are significant differences between the objective (airport) and subjective (passenger) perspectives of passenger experience. These differences in experience perspective suggest that the Level of Service (LOS) metrics (IATA, 2004) are not suitable for the evaluation of passenger experience in a terminal building, as considered from the perspective of the passenger.

The conceptual model provides a framework that can be used by airport planners and designers to understand passenger behaviour in the airport terminal. The model can be used as a tool to evaluate the effects of different terminal design or passenger experience initiatives, by decomposing the effects of the proposed initiatives into the factors of influence described for each type of experience (Figure 40). The relationships defined in the model provide a theoretical framework for this evaluation, and could reduce the amount of “trial and error” often associated with new passenger initiatives (Ramsden, 2013).
Chapter 8. Principles of Experience Design for Airport Terminals

In this chapter, the research outcomes are presented as a set of six experience design principles. The principles utilise the new knowledge expressed in the conceptual model (Chapter 7) to optimise the allocation of space in the airport terminal. The principles in this chapter represent a departure from the traditional LOS approach to space allocation, which assigns the same amount of space for each passenger, regardless of their behaviour. Using the knowledge gained about the behaviour of passengers in the airport building, the six principles provide guidelines for space allocation based on the engagement and time sensitivity of passengers.

The results from field study two (Chapter 6) showed that the relationship between time sensitivity and degree of passenger engagement was important in its characterisation of the passenger experience in the airport environment. This relationship was presented as a matrix of possible permutations of engaged/not engaged and time sensitive/not time sensitive options (Figure 39). The matrix from Figure 39 is used as the framework for illustrating the six principles of experience design described in this chapter (Figure 47).

![Figure 47: A summary of the six principles of experience design for airport terminals](image)

The remainder of this chapter presents each of the six principles summarised in Figure 47 and concludes with a discussion of strategies that can be used to optimise the allocation of space and returns on investment in terminal facilities. The mathematical relationships that underpin the six principles presented in this
chapter are shown in Appendix M. An example application of the principles is shown in Appendix N.

8.1 Principle of Incompatibility

The Principle of Incompatibility states that it is not possible to satisfy both time sensitivity and engagement criteria for a given passenger simultaneously.

The design of passenger terminals is strongly influenced by two key industry trends: automation/self-service and retail expansion (Chapter 2). These two trends target the Efficient Enthusiast category of passengers (Figure 39). Automation and self-service, by reducing processing times, meets the goals of time sensitivity of this passenger segment. Similarly, retail expansion meets the desire of the Efficient Enthusiast to engage in the airport environment. In practice, however, this targeted passenger segment, is characterised by an incompatible set of constraints: time sensitivity and engagement.

The two goals of time sensitivity and engagement are not possible to satisfy simultaneously. By definition, engagement in the airport environment implies a longer dwell time in the terminal, while time sensitivity implies a preference for shorter terminal dwell time (Figure 48). These constraints cannot be met for a given passenger at the same time. This conflict is supported by the research findings that
showed the Efficient Enthusiast category corresponded to an empty set of passengers at the research airport (Chapter 6).

Accordingly, the principle of incompatibility states that it is not possible to satisfy both time sensitivity and engagement criteria for a given passenger simultaneously. The principle is represented in Figure 48 as an empty segment (shown shaded).

8.2 Principle of Time Sensitivity

The Principle of Time Sensitivity states that due to differences in passengers’ sensitivity to time, passengers who are time sensitive will occupy a smaller passenger footprint, while passengers who are not sensitive to time will occupy a larger terminal footprint.

The outcomes of this research have shown that time is the most important factor of influence on the passenger experience (Chapter 5). The research has also shown that passengers relate to their time in the airport in different ways (Chapter 6): some passengers exhibit sensitivity to time in the airport (they hate queuing and waiting), while others are not as sensitive (they are not that bothered by queuing and waiting).

![Figure 49: Principle of Time Sensitivity](image)

The time sensitivity of the passenger will affect the passenger’s footprint in the terminal building, i.e. the total amount of space that is occupied by the passenger...
while in the terminal (Figure 49). The relationship between the amount of space and amount of time used by passengers in the terminal is currently defined by the Level of Service metrics (Figure 3). In these metrics, it is assumed that all passengers take up an equal amount of space while in the terminal.

In practice, the time sensitivity of the passenger will affect their footprint in the terminal building. Passengers who are time sensitive will take up less space, while passengers who are not time sensitive will take up more space.

The principle of time sensitivity states that due to differences in passengers’ sensitivity to time, passengers who are time sensitive will occupy a smaller passenger footprint, while passengers who are not sensitive to time will occupy a larger terminal footprint. The principle of time sensitivity is illustrated in Figure 49, the shaded segments show the effects of passenger time sensitivity on the terminal footprint.

### 8.3 Principle of Engagement

The Principle of Engagement states that due to differences in the degrees of passenger engagement in the airport environment, passengers who are engaged will occupy a larger terminal footprint. Passengers who are not engaged will occupy a larger footprint if they are not time sensitive, and a smaller footprint if they are time sensitive.

The Level of Service metrics (Chapter 2) describe the relationship between time and space in a terminal building. At a high level, the longer a passenger spends inside the terminal building, the larger the allocated footprint per passenger (Figure 3). Passenger engagement in the terminal environment implies that passengers spend more time, and therefore, take up more space, in the terminal building (Figure 39).

Passenger non-engagement, however, does not necessarily imply a smaller passenger footprint (Figure 50). For not engaged passengers, the footprint will depend on whether or not the passenger is time sensitive. Passengers who are not time sensitive (and not engaged) will occupy a larger footprint. Passengers who are time sensitive (and not engaged) will occupy a smaller footprint. Note that time sensitivity does not affect the footprint of engaged passengers due to the principle
of incompatibility (i.e. it is not possible for passengers to be engaged and time sensitive).

![Figure 50: Principle of Engagement](image)

The principle of engagement states that due to differences in the degrees of passenger engagement in the airport environment, passengers who are engaged will occupy a larger terminal footprint. Passengers who are not engaged will occupy a larger footprint if they are not time sensitive, and a smaller footprint if they are time sensitive. The principle of engagement is illustrated in Figure 50, the shaded segments show the effects of passenger engagement on the terminal footprint.

### 8.4 Principle of Retail Expansion

*The Principle of Retail Expansion states that the total space in the terminal building that is allocated to retail expansion should be in proportion to the size of the engaged and non-time sensitive passenger segment.*

De-regulation in the airline industry and the introduction of low-cost carriers have resulted in airports being increasingly reliant on revenue generated from non-aviation related sources. This of course has fuelled the trend towards the expansion of retail in airports world-wide (Chapter 2).

Underpinning retail expansion is the assumption that passengers will engage in the airport environment. As engagement is a necessary pre-cursor to spending
(Livingstone, 2014), it follows that only the engaged portion of passengers have the potential to generate revenue. Note that from the principle of incompatibility, all engaged passengers are not time sensitive.

In order to maximise the potential revenue per passenger, the not engaged (not time sensitive) passengers would need to shift into the engaged (not time sensitive segment), as shown in Figure 51. By shifting into this segment, the returns per passenger footprint would increase: the non-time sensitive passengers take up space, but do not generate any revenue; converting them into engaged passengers potentially opens an opportunity for revenue generation.

![Figure 51: Principle of Retail Expansion](image)

The principle of retail expansion, therefore, states that the total space in the terminal building that is allocated to retail expansion should be in proportion to the size of the engaged and non-time sensitive passenger segment.

### 8.5 Principle of Efficiency

The Principle of Efficiency states that in order to maximise the returns on passenger terminal footprint invested, the total terminal dwell time for passengers that do not engage in the retail environment should be minimised.
One of the key trends in terminal design is the global move towards automation and the introduction of self-service technologies (Chapter 2). The effect of this trend is the reduction of the passenger footprint required to service each passenger. This is based on the assumption that automated and self-service solutions will be faster and take up less space per passenger process, therefore resulting in a smaller passenger footprint (Figure 3).

A reduction in passenger footprint implies a reduction in the cost of delivering the amount of space required by the passenger in the terminal building. It follows that a reduction in the cost of delivering a given passenger footprint will have the net effect of increasing the return on passenger footprint invested.

The net return on passenger footprint invested is therefore a trade-off between increasing costs and revenues (retail expansion), and decreasing costs by reducing the total amount of time in the terminal building per passenger (automation and self-service).

Accordingly, the principle of efficiency states that in order to maximise the returns on passenger terminal footprint invested, the total terminal dwell time for passengers that do not engage in the retail environment should be minimised. This principle is illustrated in Figure 52.
8.6 Principle of Proficiency

The Principle of Proficiency states that future terminal design should be optimised towards efficient processing rather than retail expansion.

As the number of people travelling by air each year increases (IATA, 2012), and due to the transferability of knowledge though public experience (Chapter 5), it is possible to infer that the proportion of proficient passengers will increase over time (Csikszentmihalyi & LeFevre, 1989; Gladwell, 2008; Joy, 2012; Levitin, 2013; Weisberg, 1999). In other words, on a global scale, there is a positive trend in passenger proficiency.

This upward trend in passenger proficiency is similar to the technology revolution that has unfolded over the last few decades (Joy, 2012). Just as the proliferation of technology gave rise to a generation of digital natives, it is reasonable to infer that the same conditions will give rise to a generation of air-travel natives. As digital natives have high levels of comfort with technology, the air-travel natives will have an analogous level of comfort, or proficiency, in the airport environment.

From the outcomes of this research, it can be inferred that as passenger proficiency increases, so does the passengers’ overall sensitivity to time (Chapter 6). As passengers become more time sensitive, their engagement in the airport environment...
environment decreases (Chapter 6). Thus, as passengers become more proficient, they will become more time sensitive and their engagement in the airport environment will decrease. Therefore, in the future, air-travel natives will result in an increase in the proportion of time sensitive, not engaged passengers (Figure 53).

From the principle of efficiency, it can be inferred that the trend towards increased passenger proficiency will lead to a decrease in passenger engagement, which will decrease the potential return per passenger terminal footprint invested.

The principle of proficiency, therefore, states that future terminal design should be optimised towards efficient processing rather than retail expansion.

8.7 Strategies for increasing returns
In this section, two main strategies for increasing the potential returns per passenger terminal footprint are discussed. The strategies are derived from the experience design principles defined in this chapter, and reflect the underlying relationship between time sensitivity and engagement of passengers in the airport environment (Chapters 5 and 6).

In general, in order to increase the returns per passenger footprint, one can either:

1. Increase the level of passenger engagement, and therefore increase the proportion of passengers who generate revenue in the terminal building (principle of engagement and principle of retail expansion), or

2. Decrease the passenger footprint, by decreasing the dwell time for each passenger in the terminal building (principle of time sensitivity and principle of efficiency).

In terms of the passenger segments described in Figure 39, the above strategies map to either increasing the proportion of passengers in the Airport Enthusiast segment (Principle of Retail Expansion), or increasing the proportion of passengers in the Efficiency Lover segment (Principle of Efficiency).

The first strategy, increasing the engagement level of passengers in the terminal, involves the conversion of not engaged passengers into the Airport Enthusiast
category. This could be done in one of two ways: (i) changing the way that passengers relate to their time in the airport, or (ii) providing new options that will entice engagement in the airport environment.

The first option, related to changing the way that passengers relate to their airport time, requires a change in core passenger characteristics. Although this may be achievable with marketing campaigns aimed at the pre-travel phase (the passenger would need to be converted before arriving at the airport), it is unlikely that this approach will result in widespread success. The main reason for this is that the modes of passenger engagement identified are quite central to the passengers as people. Effecting change at this core characteristic level would require one to overcome a lot of inertia, and would thus take a lot of effort and time.

The second option, providing new options to entice engagement from not engaged passengers, is by comparison a much easier strategy. In particular, this strategy has a large sector of passengers that are potentially easy to seduce into engagement. The Time Filler segment of passengers, due to their ambivalence to time sensitivity, represent a prime target for conversion into Airport Enthusiasts. As this segment represented 48% of travellers in the airport that the research was conducted at, there is potential for significant results. The Efficiency Lovers, on the other hand, are a harder segment for conversion due to their sensitivity to time, and thus lack of engagement in the airport environment.

The strategy of exploring new engagement options targeted at existing Time Fillers is particularly suitable for airports that have already invested heavily in the expansion of retail infrastructure in the terminal building. The exact nature of the offerings remains a topic for further research.

The second strategy, decreasing the passenger footprint by decreasing the total dwell time can be achieved in one of two ways. Firstly, the speed with which passengers are processed can be reduced. This is currently being addressed by the various “fast travel” initiatives being led by organisations such as IATA and SITA (Copart, 2012; SITA, 2012, 2013). The second way that passenger dwell time can be reduced is through the reduction of airport retail. In many airports, especially the
emerging “super-terminals”, the sheer presence of expansive retail areas increases the amount of time that passengers need to navigate through the airport (Mazhar, 2013).

The second option, reducing the number of processes in the terminal, presents an opportunity for the reduction of the passenger footprint in the terminal. In particular, as the reduction of processes is ultimately connected to an increase in processing speed, this option targets the core desires of the Efficiency Lovers. This is particularly important given the trend in passenger proficiency, and likely increase in size of this passenger segment (principle of proficiency).

Currently, the processes traditionally associated with international departures in most airport terminals consist of check-in, security, customs, boarding and discretionary (retail) activities (Popovic, et al., 2010). The possibility of reducing the number of processes has only recently been introduced as a concept (Harrison, 2013b; Harrison, et al., 2014). The practical realisation of this concept would involve the development of aviation data standards, global passenger identifiers, a national authentication service and secure messaging protocols. This approach has successfully been developed, and is being implemented in the health care industry (Bird, Goodchild, & Beale, 2000; ISO/IEC JTC1 SC32 WG2 Development/Maintenance, 2004; NEHTA, 2014; Obrst, 2003).

In addition to reducing the passenger footprint in the terminal, the consolidation of processes would also result in a simplification in the terminal’s architecture. At present, there is a tight coupling between the physical architecture of a terminal building, and the processes that passengers must go through in order to board a plane (Chapter 2). It follows that a simplification in the underlying passenger processes would impact the physical design of the terminal building.

8.8 Summary
The set of six design principles presented in this chapter show how the outcomes of this research can be used by airport planners to optimise the allocation of space in an airport terminal based on characteristics of passenger behaviour.
The six principles of experience design defined in this chapter are summarised below:

1. The Principle of Incompatibility states that it is not possible to satisfy both time sensitivity and engagement criteria for a given passenger simultaneously.

2. The Principle of Time Sensitivity states that due to differences in passengers’ sensitivity to time, passengers who are time sensitive will occupy a smaller footprint, while passengers who are not sensitive to time will occupy a larger footprint.

3. The Principle of Engagement states that due to differences in the degrees of passenger engagement in the airport environment, passengers who are engaged will occupy a larger footprint, and passengers who are not engaged will occupy a larger footprint if they are not time sensitive, but a smaller footprint if they are time sensitive.

4. The Principle of Retail Expansion states that the total space in the terminal building that is allocated to retail expansion should be in proportion to the size of the engaged and non-time sensitive passenger segment.

5. The Principle of Efficiency states that in order to maximise the returns on passenger footprint invested, the total terminal dwell time for passengers that do not engage in the retail environment should be minimised.

6. The Principle of Proficiency states that future terminal design should be optimised towards efficient processing rather than retail expansion.

Using these six principles as strategies for the improvement of potential returns were discussed. These strategies included options for increasing passenger engagement (and therefore revenue), and also decreasing the passenger footprint (though the consolidation of airport processes, and thus reduction in passenger processing times).

The principles presented in this chapter, together with their corresponding mathematical formulae (Appendix M and N) and the conceptual model (Chapter 7)
are a specification for the development of a tool to assist in the optimisation of space in airport terminals, from a passenger experience perspective.

The following chapter presents the conclusions of this research, outlining the contributions to knowledge and identifying opportunities for future work.
Chapter 9. Conclusion and Opportunities

Following de-regulation and recent changes in the aviation industry, competition amongst airlines has made air-travel accessible to an increasing number of people each year (IATA, 2012). This trend is likely to continue: it is projected that for the Asia-Pacific region alone the passenger numbers are expected to triple over the next two decades (Air Transport Action Group, 2012).

In order to service future passenger traffic, airport operators need to design passenger terminals to accommodate this growth. However, due to increasing cost pressures within the industry, the current trajectory of terminal design will result in buildings which are too costly to operate or simply too large to fit into the available real estate in established cities (Jager & Ofner, 2012). There is a recognised need to create new paradigms for the design of future airport terminals.

In addition to the cost pressures affecting terminal design, there is also a growing need to ensure that the designed airport environment engenders quality passenger experiences. The recent focus on the passenger experience has emerged from a variety of orthogonal developments in technology, wireless communications and social networking (Mayer, 2012). As a result of these changes, passenger experience and satisfaction have been directly linked to airport profitability (Carroll, 2012; Wagnert, 2013).

From a design perspective, the connection between profit and passenger experience has changed the way that a passenger’s journey within the airport is approached. Where in the past, the treatment of passengers was strictly governed by space and time considerations (ACRP, 2011), the focus has now shifted to ensuring that passengers have a good experience in the terminal building (Mayer, 2012).

Although each passenger’s experience is unique and subjective, there are generalizations that one can make about sub-groups of passengers. In this work, a passenger oriented approach towards developing a deeper understanding of the
factors of influence of passenger experience was taken. The approach led to the discovery of factors that influence the passenger experience, allowing a conceptual model of passenger experience to be developed. These insights were used as the foundation for the articulation of six principles that can be used to optimise the allocation of space from a passenger experience perspective.

9.1 Summary of research findings

This research set out to address a gap in knowledge identified in the area of terminal design and passenger experience (Chapter 1). It was discovered that although passenger experience has become recognised as increasingly important, in practice, it was not actually being considered as a factor in the process of terminal design (Harrison, et al., 2012). A key reason for the lack of inclusion of the passengers’ perspective of experience was uncovered through a paradox identified in the Level of Service (LOS) metrics on which terminal design is currently based (Chapter 2). The identification of this paradox in the LOS metrics, and the separation of operational and passenger perspectives of experience (Chapter 3) were key points of inflection in this research.

Using a qualitative research approach based on direct observation and interviews conducted with 199 participants in-situ (Chapter 4), this research investigated two areas contributing to current gaps in knowledge. The first of these areas was focussed around the identification of factors that actually influence the passenger experience. This objective was framed as the first research question addressed:

1.1. Which of the potential factors (time, service, environment, artefact) actually influence the passenger experience?

1.2. What is the relative importance of these factors?

A set of four factors (time, service, environment and artefact) were identified as theoretically having an influence on the passengers’ airport experience (Chapter 3). These were investigated in field study one (Chapter 5) resulting in the discovery that time is the primary factor of passenger experience influence.
The second area of enquiry probed deeper into the relationship between passengers and their key factor of experience (time). This was framed as the second research question addressed:

2.1. How do passengers relate to their key factor(s) of influence?
2.2. What are the modes of passenger engagement in the terminal building?

The second research question was investigated in field study two. From the results of field study two (Chapter 6), the relationship between passengers and their airport time was articulated as four distinct modes of passenger engagement. The modes of engagement led to a novel segmentation of passengers based on their time sensitivity and level of engagement in the airport environment (Airport Enthusiast, Time Filler, Efficiency Lover and Efficient Enthusiast).

9.2 Summary of research outcomes

The findings of the two field studies were used to create a conceptual model of passenger experience (Chapter 7). The model provides a framework for understanding the behaviour of passengers in the airport terminal. The conceptual model can be used by airport planners and designers as a framework for understanding passenger behaviour.

The research outcomes were also distilled into a set of six principles for experience design in airport terminals (Chapter 8):

1. The Principle of Incompatibility
2. The Principle of Time Sensitivity
3. The Principle of Engagement
4. The Principle of Retail Expansion
5. The Principle of Efficiency
6. The Principle of Proficiency

The principles augment existing LOS metrics by integrating the effects of passenger behaviour on a passenger’s footprint in the airport terminal. The six principles, along with the mathematical equations that underpin them, represent a specification for the creation of a tool to assist airport planners and designers to
optimise the allocation of space in terminal buildings from a passenger experience perspective.

9.3 Summary of research implications

The effects of air-travel accessibility due to cheap airfares and globally extensive networks, together with the effects of widely accessible information through social media and the proliferation of the internet (Chapter 1), were identified as impacting the future characteristics of passengers (Chapter 8). In the future, travellers will increasingly exhibit characteristics of air-travel natives: a generation of proficient travellers, who are interested in efficient processing and have a reduced desire to engage in the airport environment.

The six principles of experience design that stemmed from this research (Chapter 8) provided guidelines for how to optimise space allocation when planning terminals for future air-travel natives. The application of the six principles to terminal design gave rise to two key strategies for the allocation of space in terminal buildings:

1. Focus on efficient processing. Passenger processes ought to be consolidated in order to increase the efficiency with which passengers are processed within the terminal building.

2. Reconsider passenger engagement. Passengers are becoming decreasingly engaged in the retail offerings of today. The concept of “retail” needs to be redefined in order to maintain passenger engagement in the future.

Approaching terminal planning and design from a passenger oriented perspective, as argued in this thesis, challenges the status quo of how things are currently done in the industry. The concept of amalgamating processes and drawing attention away from retail expansion (in its current form) runs against common practice (Chapters 1 and 2). The outcomes of this research suggest that the previously assumed link between passenger satisfaction and retail expansion are unsubstantiated, and that strategically, airport terminals should target efficient processing in order to optimise both passenger experience and returns on investment (Chapter 8).
9.4 Contributions to knowledge

The findings and outcomes of this work have advanced existing theoretical knowledge about passengers and their experience in airport terminals. One of the main contributions of this work has been the identification of the misalignment between operational and passenger oriented perspectives of passenger experience, highlighting the unsuitability of existing LOS metrics for the evaluation of passenger satisfaction (Chapters 2 and 3). Identifying this paradox in the LOS metrics, and developing a conceptual model for the expression of passenger experience in an airport terminal (Chapters 3 and 7) suggest the re-examination of how passenger experience is evaluated in an airport environment. This knowledge contributes towards a better understanding of how passengers behave in, and experience, the airport terminal.

A further contribution has been made in the formulation of six principles for experience design in passenger terminals (Chapter 8). The principles may be utilised by airport planners and designers to optimise passenger space allocation, based on a better understanding of passenger behaviour (Chapter 7).

Two strategies were proposed for improving the potential returns on passenger terminal footprint investment. The first of these involves the exploration of new opportunities for engagement targeting the large segment of passengers that could be converted into spenders (Time Fillers). The second involves the consolidation of airport processes (such as check-in, security, customs and boarding) as a way to increase the efficiency of passenger processing, and thus decrease the amount of footprint required by time sensitive passengers (Efficiency Lovers).

9.5 Research limitations

As with all research, there will always be a number of limitations that ought to be considered when forming generalized conclusions based on the underlying research. The generalizability of the results of this work may be affected by the size of the sample data set and the singular location of data collection (Brisbane International Airport).
Although the passengers interviewed were representative of the general travelling population at Brisbane International (Chapter 5 and 6), the results would be enriched if the study were repeated in a wider range of geographical locations. Based on the work to date, it is anticipated that the characteristics of travellers may remain the same, however, the proportion of travellers in each of the four segments (Chapter 7) is likely to be different based on the type of airport that the interviews are conducted at.

A limitation may also be perceived with respect to the top-down categorization approach used in the analysis. It may be argued that the process of validating the theoretical conceptual model (Chapter 3) introduced a bias towards examining the data from the perspective of the conceptual model. This in turn may have resulted in the passenger experience being described through an incomplete set of factors (time, service, environment and artefact). This, of course, is necessarily true. However, as this research constitutes one of the earlier works in the theoretical exploration of factors that influence the passenger experience, it is appropriate that the enquiry begins by interrogating the key factors that influence the passenger experience. It is envisaged that further research using different techniques for data collection and analysis can in time enrich the findings in this work.

9.6 Opportunities for future work

This research opens up several opportunities for future work. In the first instance, the development of use cases for the six principles (Chapter 8) would help to strengthen the validity and generalizability of the principles. The principles developed in this work have not been used in a “real case” scenario, i.e. in the context of planning or designing an actual airport terminal. It is envisaged that the use of these principles in a practical situation would help to refine and strengthen the outcomes of this work.

To this end, the six principles are well suited to form the theoretical foundation for the implementation of an airport planning tool (Harrison, 2013c). It can be envisaged that such a tool could be used to help optimise the allocation of space during the design phase. From a research perspective, the investigation of the
A correlation between space optimisation and returns of investment is an area for further investigation from an economics and design perspective.

A second avenue for further research stems from the observation that the future of terminal design will be heavily influenced by the ability of the industry to support the shift from physical to virtual design (Harrison, et al., 2014). In order for this shift to be enabled, industry wide data standards and global passenger identification systems will need to be developed (Harrison, 2013b). Addressing these issues creates many research opportunities at the crossroads of design, software development and data architecture.

As the number of wireless data capture devices becomes more wide-spread, the opportunities for exploring the passenger experience from the perspective of “smart cities” (Caragliu, Del Bo, & Nijkamp, 2011) opens exiting new areas opportunities for both enhancing the passenger experience, and reducing operating costs for airports. As an example, one could envisage adapting “smart lighting” (lighting that adapts in intensity based on the concentration of people in an area) for in-terminal use could lead to both enhanced ambiance for passengers as well as operational savings for the airport.

This research has taken a passenger oriented perspective on experience. An equally fascinating area of enquiry would be to replicate this research with a focus on airport, rather than passenger, characteristics. The correlation of passenger distributions in each of the four passenger segments (Airport Enthusiast, Time Filler, Efficiency Lover and Efficient Enthusiast) with core airport characteristics would allow the results from this research to be generalised for global application.

Finally, the generalisation of the experience design principles developed in this research to areas outside aviation open a number of opportunities. Experience and experience design are active and growing fields of research. The principles developed in this work, should be extendible to the optimisation of experience in eHealth (Gomez & Harrison, 2014) and the design of other environments where humans interact on a large scale, such as hospitals, train stations and education facilities and public spaces.
9.7 Summary

The quality of passenger experiences have been recognised as a contributing factor towards airport profitability (Causon, 2011; de Groof, 2012; Mayer, 2013; Wagnert, 2013). Despite the inclusion of passenger experience as a priority in airport operations, there has been relatively little research that has targeted understanding of what influences passenger experience in the airport terminal. As a consequence, the needs of passengers have not directly been included in the terminal design process (ACRP, 2011; Correia, et al., 2008b; de Barros, et al., 2007; Yen, et al., 2001).

In this research, terminal design was explored from a passenger oriented perspective. By taking this approach, a paradox in the Level of Service (LOS) metrics was identified, suggesting the unsuitability of the metrics as a measure of passenger satisfaction (Harrison, et al., 2012). Two qualitative field studies were conducted, both involving interviews with passengers in the departures section of Brisbane International Terminal. The results of field studies one and two were used to develop:

1. A conceptual model of passenger experience (Harrison, et al., 2013, 2015; Harrison, et al., 2012). The model provides a framework for understanding the experience of passengers in the terminal building.
2. Six experience design principles. The principles augment the LOS metrics by providing guidelines for the allocation of space based on the experience of passengers in the terminal building.

The outcomes of this research have extended the theoretical knowledge about passenger experience. The explicit linkage of the conceptual model of passenger experience to the principles of experience design and their underlying mathematical equations serve as a specification for the application of the new theoretical knowledge to the practice of terminal design and planning. The connection between the theoretical and practical aspects of this research distinguish this work from prior related works, creating a foundation for future tool development for airport planning and design.
References


Hehir, G. (2012). [Personal communication with Geoff Hehir, BVN Architects].


Kolatorski, P. (2012). [Personal communication with Pawel Kolatorski, Zurich International Airport].


Levitin, D. (2013). This is your brain on music: Understanding a human obsession: Atlantic Books Ltd.


Livingstone, A. (2014). Passenger experience in an airport retail environment PhD. Queensland University of Technology (QUT), Brisbane, Australia.


Mayerhofer, P. (2012). [Personal communication with Peter Mayerhofer, Vienna International Airport].


Prabhakaran, S. (2013). [Personal communication with Shreemen Prabhakaran, Dubai International Airport].


Tarbuck, S. (2012b). [Personal communication with Stephen Tarbuck, Copenhagen International Airport].


Transport Canada. (1979). *A discussion on Level of Service condition and methodology for calculating airport capacity.*


Verbal communication (2012). [Personal communication with Zurich International Airport].


Appendices

Appendix A: QUT ethics approval for field study one and two

Dear Ms Anna Harrison,

A UHREC should clearly communicate its decisions about a research proposal to the researcher and the final decision to approve or reject a proposal should be communicated to the researcher in writing. This Approval Certificate serves as your written notice that the proposal has met the requirements of the National Statement on Research involving Human Participation and has been approved on that basis. You are therefore authorised to commence activities as outlined in your proposal application, subject to any specific and standard conditions detailed in this document.

Within this Approval Certificate are:

- Project Details
- Participant Details
- Conditions of Approval (Specific and Standard)

Researchers should report to the UHREC, via the Research Ethics Coordinator, events that might affect continued ethical acceptability of the project, including, but not limited to:

(a) serious or unexpected adverse effects on participants; and
(b) proposed significant changes in the conduct, the participant profile or the risks of the proposed research.

Further information regarding your ongoing obligations regarding human based research can be found via the Research Ethics website http://www.research.qut.edu.au/ethics/ or by contacting the Research Ethics Coordinator on 07 3138 2001 or ethicscontact@qut.edu.au.

If any details within this Approval Certificate are incorrect please advise the Research Ethics Unit within 10 days of receipt of this certificate.

---

**Project Details**

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<th>Category of Approval:</th>
<th>Human non-HREC</th>
</tr>
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<td>27/10/2011</td>
</tr>
<tr>
<td>Approved Until:</td>
<td>27/10/2014</td>
</tr>
<tr>
<td>Approval Number:</td>
<td>1100001377</td>
</tr>
<tr>
<td>Project Title:</td>
<td>Improving the airport passenger experience: A service oriented approach to terminal design</td>
</tr>
<tr>
<td>Experiment Summary:</td>
<td>Investigate the airport passenger experience, specifically, how perceptions of time and space are influenced by perceptions of service quality</td>
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---

**Investigator Details**

- **Chief Investigator:** Ms Anna Harrison
- **Other Staff/Students:**
  - Prof Vesna Popovic (Internal, Supervisor)
  - Dr Ben Kraal (Internal, Supervisor)
  - Dr Tristan Kleinschmidt (Internal, Supervisor)

---

**Participant Details**

- **Participants:** Approximately 120
- **Location(s) of the Work:** QUT and Brisbane International Airport
University Human Research Ethics Committee

HUMAN ETHICS APPROVAL CERTIFICATE

NHMRC Registered Committee Number EC00111

Conditions of Approval

Specific Conditions of Approval:
No special conditions placed on approval by the UHREC. Standard conditions apply.

Standard Conditions of Approval:
The University’s standard conditions of approval require the research team to:

1. Conduct the project in accordance with University policy, NHMRC / AVCC guidelines and regulations, and the provisions of any relevant State / Territory or Commonwealth regulations or legislation;

2. Respond to the requests and instructions of the University Human Research Ethics Committee (UHREC);

3. Advise the Research Ethics Coordinator immediately if any complaints are made, or expressions of concern are raised, in relation to the project;

4. Suspend or modify the project if the risks to participants are found to be disproportionate to the benefits, and immediately advise the Research Ethics Coordinator of this action;

5. Cease any involvement of any participant if continuation of the research may be harmful to that person, and immediately advise the Research Ethics Coordinator of this action;

6. Advise the Research Ethics Coordinator of any unforeseen development or events that might affect the continued ethical acceptability of the project;

7. Report on the progress of the approved project at least annually, or at intervals determined by the Committee;

8. Where the research is publicly or privately funded) publish the results of the project is such a way to permit scrutiny and contribute to public knowledge; and

9. Ensure that the results of the research are made available to the participants.

Modifying your Ethical Clearance:
Requests for variations must be made via submission of a Request for Variation to Existing Clearance Form (http://www.research.qut.edu.au/ethics/forms/humivarvar.jsp) to the Research Ethics Coordinator. Minor changes will be assessed on a case by case basis.

It generally takes 7-14 days to process and notify the Chief Investigator of the outcome of a request for a variation.

Major changes, depending upon the nature of your request, may require submission of a new application.

Audits:
All active ethical clearances are subject to random audit by the UHREC, which will include the review of the signed consent forms for participants, whether any modifications / variations to the project have been approved, and the data storage arrangements.

End of Document
Appendix B: Field study one participant information
<table>
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<tr>
<th>Field Study One</th>
<th>Question Posed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interviewer</strong></td>
<td>This is not a survey, there are no right or wrong answers, and I have only one question ... describe your experience at the airport today?</td>
</tr>
<tr>
<td><strong>Respondent</strong></td>
<td>...</td>
</tr>
<tr>
<td><strong>Interviewer</strong></td>
<td>Oh, right ... and did you arrive long before your departure time?</td>
</tr>
<tr>
<td><strong>Respondent</strong></td>
<td>...</td>
</tr>
<tr>
<td><strong>Interviewer</strong></td>
<td>Alright, very good. And check-in- did that take long? How was it today?</td>
</tr>
<tr>
<td><strong>Respondent</strong></td>
<td>...</td>
</tr>
<tr>
<td><strong>Interviewer</strong></td>
<td>I see ... Do you fly in and out of here often?</td>
</tr>
<tr>
<td><strong>Respondent</strong></td>
<td>...</td>
</tr>
<tr>
<td><strong>Interviewer</strong></td>
<td>So, did you have any trouble finding where you had to go, or what you had to do?</td>
</tr>
<tr>
<td><strong>Respondent</strong></td>
<td>...</td>
</tr>
<tr>
<td><strong>Interviewer</strong></td>
<td>And did you hang out upstairs (landside) or come straight down (airside) today?</td>
</tr>
<tr>
<td><strong>Respondent</strong></td>
<td>...</td>
</tr>
<tr>
<td><strong>Interviewer</strong></td>
<td>And how was security and all that today?</td>
</tr>
<tr>
<td><strong>Respondent</strong></td>
<td>...</td>
</tr>
<tr>
<td><strong>Interviewer</strong></td>
<td>Any confusion about what to take out and what to leave in?</td>
</tr>
<tr>
<td><strong>Respondent</strong></td>
<td>...</td>
</tr>
<tr>
<td><strong>Interviewer</strong></td>
<td>Great ... and how does this experience compare to other places you may have flown at all?</td>
</tr>
<tr>
<td><strong>Respondent</strong></td>
<td>...</td>
</tr>
<tr>
<td><strong>Interviewer</strong></td>
<td>Very good. Thanks so much for your time I really appreciate it, have a safe trip.</td>
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### Appendix D: Field Study one participant demographics

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<th>Participants</th>
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<th>No. of Wavers</th>
<th>Purpose of Trip</th>
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<td><strong>Total</strong></td>
<td><strong>06:57:07</strong></td>
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Appendix E: Field study two participant recruitment

www.annaharrison.com/QUT/

www.facebook.com/anna.a.harrison

Anna Andrusiewicz Harrison created a page.

QUT: Call for Participation

Looking for people flying out of Brisbane International in 2012

Like · Comment · February 22 at 3:42pm

Anna Andrusiewicz Harrison

FOR THE GREATER GOOD … I am looking for people flying out of Brisbane International in 2012 … info at www.annaharrison.com/QUT, please pass the link on to friends … Great champagne hamper to be won :-)
Appendix F: Field study two participant information

PARTICIPANT INFORMATION FOR QUT RESEARCH PROJECT

Improvings the Airport Passenger Experience: A Service Oriented Approach to Terminal Design
QUT Ethic Approval Number 110001377

RESEARCH TEAM

School of Design – Creative Industries Faculty – QUT
Principal Researcher: Anna Harrison, PhD Student
Associate Researchers: Professor Vesna Popovic Dr Ben Kraai

DESCRIPTION

This project is being undertaken as part of a PhD for Anna Harrison.
The purpose of this project is to investigate the airport passenger experience, specifically, how perceptions of time and space are influenced by perceptions of service quality. It is expected that the results will generate new knowledge about the passenger experience, and will facilitate airports in designing a more user-friendly experience for passengers.

You are invited to participate in this project because you represent one of the airport users; and your opinions, ideas and experience in the airport environment will be highly valuable in order for us to gain insight into passenger experience.

This project is conducted as part of the Airports of the Future research project at QUT (www.airports.ofthefuture.qut.edu.au). The Airports of the Future research project is supported under the Australian Research Council’s Linkage Projects funding scheme (LP0990135). The Researcher also acknowledges the contribution of the many aviation industry stakeholders, including Brisbane Airport Corporation, also involved in this project. More details on the project and its participants can be found at www.airports.ofthefuture.qut.edu.au.

PARTICIPATION

Your participation in this project is entirely voluntary. If you do agree to participate, you can withdraw from the project without comment or penalty, if you withdraw, on request any identifiable information already obtained from you will be destroyed. Your decision to participate, or not participate, will in no way impact upon your current or future relationship with QUT, with the Australian Research Council (ARC) or with Brisbane International Airport.

Your participation in the project will involve:

1. A pre-travel briefing (i.e. this session), during which you will be briefed on what to expect from the project. You will also be asked a number of questions related to your upcoming trip, e.g., when is your flight, how did you choose the flight, have you taken this flight before, how much time do you allocate at the airport for this flight, and why. This will take place at a mutually agreed location, e.g. coffee shop in Brisbane, and should take no longer than an hour.

2. On the date of travel, you will be asked to complete a “diary” of your airport experience. The diary will be filled out on your mobile phone/tablet. Your airport experience will also be videotaped by a team member (known to you) from a discreet distance. The creation of the video recording will not have a time impact on you. Completion of the diary should take approximately 5 minutes.

3. A post-travel debriefing will be conducted a few weeks after you return from your travel. During this session, you will be asked a number of questions related to airport passenger experience (as you remember it), e.g., when was your flight, how was your airport experience. This will take place at a mutually agreed location, e.g. coffee shop in Brisbane, and should take approximately half an hour.

For your convenience, the pre-travel and post-travel briefing may be administered via email. Your email address will not be stored with your responses, i.e. all responses will be de-identified.

EXPECTED BENEFITS

It is expected that this project will not benefit you directly. However, it may benefit the field of knowledge of passenger experience at airports by providing an understanding about how time, space and service influence passenger experience. We will report all our findings back to the airport, including any recommendations or comments which you may have made during your participation. We hope that airports throughout Australia will adopt our recommendations, which will lead to a better passenger experience in the future.

To recognize your contribution, should you choose to participate, the research team is offering an opportunity to be included in a prize draw. The price will be valued at approximately $300, and will be drawn at the conclusion of the project. The winner will be notified by email. Your email will not be associated with your survey responses, it will be used for entry into the prize draw only.
RISKS

There are no unforeseen risks beyond normal day-to-day living risks associated with participation in this project. All participants will have chosen to undertake international travel independently of this project, hence, were willing to accept the risks related to international travel of their own volition. These potential risks include traffic-related injury during travel to the airport and general risks associated with being in an airport terminal (e.g., zip and fall, terrorism attack).

As part of this project, participants will not be asked to undertake any activities outside of those they would normally do in an airport environment, i.e. talk and/or type into their mobile phone/tablet.

PRIVACY AND CONFIDENTIALITY

All comments and responses will be treated confidentially, and will not be made anonymous when data is coded, transcribed, or collected via the mobile phone/tablet diary application. The names of individual persons are not required in any of the responses.

All video and audio recordings will be kept safely in a secure laboratory at QUT and held on a password-controlled computer. Only members of the project team (specified above) will have access to the video and audio recordings. The video footage may be used in discussion of the results at academic or industry talks, or in academic journals. We will only use your images with your express written permission.

The (raw) data collected will not be made available to the funding body, namely the Australian Research Council, and/or the project sponsors, including the Brisbane Airport Corporation. Please note that non-identifiable data collected in this project may be used as comparative data in future projects.

CONSENT TO PARTICIPATE

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate.

QUESTIONS / FURTHER INFORMATION ABOUT THE PROJECT

If you have any questions or require any further information please contact one of the research team members below.

School of Design – Creative Industries Faculty – QUT

Anna Harrison  Vesiya Popovic  Ben Kral
anna.harrison@student.qut.edu.au  v.popovic@qut.edu.au  b.kral@qut.edu.au

CONCERNS / COMPLAINTS REGARDING THE CONDUCT OF THE PROJECT

QUT is committed to research integrity and the ethical conduct of research projects. However, if you do have any concerns or complaints about the ethical conduct of the project you may contact the QUT Research Ethics Unit on 3130 5123 or email ethicscontact@qut.edu.au. The QUT Research Ethics Unit is not connected with the research project and can facilitate a resolution to your concern in an impartial manner.

Thank you for helping with this research project. Please keep these sheets for your information.
**CONSENT FORM FOR QUT RESEARCH PROJECT**

*Interview*

**Improving the Airport Passenger Experience: A Service Oriented Approach to Terminal Design**

QUT Ethic Approval Number 1100003177

---

**RESEARCH TEAM CONTACTS**

<table>
<thead>
<tr>
<th>Anna Harrison</th>
<th>Prof Vesna Ropovic</th>
<th>Dr Ben Kraal</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:anna.harrison@student.qut.edu.au">anna.harrison@student.qut.edu.au</a></td>
<td><a href="mailto:y.ropovic@qut.edu.au">y.ropovic@qut.edu.au</a></td>
<td><a href="mailto:b.kraal@qut.edu.au">b.kraal@qut.edu.au</a></td>
</tr>
</tbody>
</table>

**STATEMENT OF CONSENT**

By signing below, you are indicating that you:

- Have read and understood the information document regarding this project.
- Have had any questions answered to your satisfaction.
- Understand that if you have any additional questions you can contact the research team.
- Understand that you are free to withdraw at any time, without comment or penalty.
- Understand that you can contact the Research Ethics Unit on 3138 5113 or email ethicscontact@qut.edu.au if you have concerns about the ethical conduct of the project.
- Understand that the project will include audio and/or video recording.
- Understand that non-identifiable data collected in this project may be used as comparative data in future projects.
- Agree to participate in the project.

Name: ____________________________________________

Signature: _______________________________________

Date: __________________________

---

**MEDIA RELEASE PROMOTIONS**

From time to time, we may like to promote our research to the general public through, for example, newspaper articles. Would you be willing to be contacted by QUT Media and Communications for possible inclusion in such stories? By ticking this box, it only means you are choosing to be contacted – you can still decide at the time not to be involved in any promotions.

- [ ] Yes, you may contact me about inclusion in promotions
- [x] No, I do not wish to be contacted about inclusion in promotions

*Please return this sheet to the investigator.*
Appendix G: Field study two image release form

Image Release: Research Participants

A photographic image (including a video recording) which is sufficiently clear to enable you to be identified as an individual is personal information. Queensland University of Technology seeks to comply with the information Privacy Principles as set out in the Information Privacy Act 2009. QUT shall, from time to time, endorse a privacy policy (see www.mops.qut.edu.au) to ensure that personal information is used and disclosed only in ways which are consistent with privacy principles and will otherwise comply with QUT’s privacy obligations under statute. In general, personal information is not disclosed or published except where an individual’s consent has been obtained.

- QUT is seeking your consent to use an image of you in peer reviewed academic papers and journals as well as on slides used for presentations at conferences.
- Participation in this release is voluntary.
- Your decision to participate or to not participate will in no way impact upon your current or future relationship with Anna Harrison or with QUT.

If you have any questions please ensure you have discussed them and are comfortable with the response before providing consent. You may choose to discuss participation with the following people:

- Anna Harrison
- Family or Friends

What is the release about? We would like to illustrate some interesting aspects of airport passenger experience within peer reviewed papers and journals as well as at conferences by using small portions of video (no longer than 1 minute) or still images recorded during observations. This video footage and/or still images will be used to highlight the findings and outcomes of the research, and will contribute to improving passenger experience within the airport.

Why do you want to include me? The focus of this research is on passenger experience within the airport terminal building, it therefore will be important to show actual participant experiences to illustrate interesting or significant findings of the research.

What will you ask me to do? Your participation will involve a team member following you and video recording your experience from a discrete distance, from entry into the airport terminal building, until you wait at your terminal gate to board your flight. This observation will form the basis of the video content.

We will also contact you after your return to Brisbane to discuss your airport experience and see if you would suggest any improvements or recommendations that could be made to improve your experience. This interview will take place at a mutually agreed location, and will only be audibly recorded. It will take approximately 30 minutes.

Are there any benefits for me in taking part? It is expected that this project will not directly benefit you. However, it may benefit the field of knowledge of passenger experience at airports by providing an understanding about how people use the airport environment. We will report our findings back to Brisbane airport, including any recommendations or comments you may have during your participation. We hope that airports throughout Australia will adopt our recommendations, which will lead to better passenger experience in the future.

As a token of appreciation, you may choose to be entered into a prize draw upon completion of the study.

Are there any risks for me in taking part? We believe there are minimal risks with your participation in this video, which you should consider:

- Your image may be included in peer reviewed papers and journals as well as in slides used for presentations at academic conferences.

Confidentiality. QUT understands that video participants may not wish to be named in this video. As a result the names of all video participants will be excluded from this video. QUT will only identify you in the video on the basis of your association with the researcher, i.e. participant in airport passenger experience.

Who will see the video? All video recordings will be kept safely in a secure laboratory at QUT, held on a password controlled computer. Only members of the research team will have access to these video recordings. The footage and/or still images may be used within peer reviewed papers and journals as well as on slides used for presentations at conferences. We will only use your images with your express permission.

Can I change my mind? You will have the opportunity to view the images/footage as we plan to use them, and can decide to withdraw at that stage. However, once the video is produced it will not be possible to withdraw.

I am interested – what should I do next? You will be required to sign the attached Consent form, acknowledging that you have read and understood the Image Release information sheet, and agree to allow the use of yours and your travelling group members image in video footage and/or still image for QUT academic purposes.

If you have any questions about this video, please do not hesitate to contact:

Anna Harrison
PhD Candidate, QUT School of Design
Email: anna.harrison@student.qut.edu.au

Thank you for helping with this research project. Please keep these sheets for your information.
Image Release: Research Participants

PLEASE RETURN THIS COMPLETED FORM TO ANNA HARRISON
A COPY WILL BE PROVIDED FOR YOUR RECORDS

If you agree to give consent regarding the use of your image in this research project, please read and complete the consent below.

Consent

- I agree to the University using, reproducing and disclosing photographic or video images of me as explained in this Image Release: Research Participants Information Sheet and Consent Form.

- I agree that I will make no claim against QUT for any payment or fee for appearing in promotional material or advertisements and release QUT from any other claims arising out of the University’s use of the images of me.

- I understand that the anonymity afforded me as a participant in the research project Improving the Airport Passenger Experience: A Service Oriented Approach to Terminal Design will be rescinded if I appear in this research project.

Name

Signature

Date

For involvement of children

Name of Child

Signature of Child

By signing below, you are indicating that you have discussed participation in the research project with your child and you are the legal guardian to provide consent to participate.

Name of Parent/Guardian

Signature of Parent/Guardian

Date

Please return this sheet to the investigator.
### Appendix H: Field study two data collection process

<table>
<thead>
<tr>
<th>Field Study Two</th>
<th>Process/Question</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Researcher</strong></td>
<td>Advertises a call for participation via Facebook, linked in and personal networks</td>
</tr>
<tr>
<td><strong>Participant</strong></td>
<td>Contacts the researcher via email expressing interest in taking part in the study</td>
</tr>
</tbody>
</table>
| **Researcher**  | Emails the potential participant, outlining the details of the study:  
  *The study involves an interview with you about your recent international travel. On your day of travel, I will meet you at the entrance to departures and accompany you on your progress through the airport (all the way to the boarding gate). Along the way, I will ask you some questions related to your airport experience, and perhaps take a photo or two of anything that we feel is relevant to our discussion.*  
  *If this sounds like something you would not mind taking part in, I would be very grateful for your help! If possible, could you email me back with your travel dates, and a signed copy of the attached consent forms (required by QUT). Thank you, and I look forward to hearing back from you.* |
| **Participant** | Emails back the forms and travel time |
| **Researcher**  | On the day of travel the researcher meets the participant at the entrance to the departures level. After an exchange of pleasantries, the researcher tells the participants to “do what they would normally do” and starts audio recording. The participant is informed that it is ok to chat with the researcher, and that they will be asked a few questions along the way.  
  *[sometime after check-in]*  
  How was your check in experience today?  
  Was it longer/shorter than what you expected?  
  How was the service?  
  *[sometime after security/customs]*  
  How was your security today?  
  Was it longer/shorter than what you expected?  
  Were there any surprises?  
  *[sometime during dwell time]*  
  How do you feel about this portion of your airport experience... [open ended here, follow up with questions based on the participants responses]  
  How would your plans change if you were guaranteed that you could make your flight in 30 minutes, rather than 2 hours? [open ended, follow up with questions based on the participants responses] |
| **Participant** | Participant boards the plane |
| **Researcher**  | Audio is turned off.  
  Thanks so much for your time I really appreciate it, have a safe trip.  
  Researcher completes observation notes immediately after completion of the interview. |
| **Researcher**  | After the participant returns from the trip, the researcher emails as follows:  
  *Thank you again for taking part in my study, hope that you had a great trip and have made it home safely! Please let me know if you have any questions, or further observations that you would like to make.* |
## Appendix I: Field study two participant demographics

<table>
<thead>
<tr>
<th>Participants</th>
<th>Interview Duration (hours)</th>
<th>No. of Travellers</th>
<th>No. of Wavers</th>
<th>Purpose of Trip</th>
<th>Used Lounge?</th>
<th>Airline Lounge?</th>
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<td><strong>Average</strong></td>
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</table>
### Appendix J: Field study two coding

<table>
<thead>
<tr>
<th>Participants</th>
<th>Time Sensitivity¹</th>
<th>Engagement²</th>
<th>Travel Proficiency</th>
<th>Purpose of Travel</th>
<th>Used Airline Lounge?</th>
<th>Passenger Type</th>
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<tbody>
<tr>
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<td>Airport Enthusiast</td>
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<td>Holiday</td>
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<td>Airport Enthusiast</td>
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<td>Time Filler</td>
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<td>Holiday</td>
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<td>Airport Enthusiast</td>
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<tr>
<td>PAX13</td>
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<td>Time Filler</td>
</tr>
</tbody>
</table>

¹ 1=Time sensitive, 0=Not time sensitive

² 1=Engaged, 0=Not engaged
Appendix K: Sample coding of transcript from field study two

PAX15
1 Adult
1 checked in bag, 1 carry on bag (plus empty rolling cabin bag)
Going to the USA for a holiday (wedding and leading mountain biking expedition)
Aeronautical Engineer
Age: 35-40
TIME SENSITIVE
NOT ENGAGED
PROFICIENT
HOLIDAY

00:00 Start at 8:09am
00:09 Looking for flight to LAX; Walking to check in
00:10 “… business, premium … none of that business … straight up economy”
00:39 Waiting in check-in line, explaining the nature of the interview; not-many structured
questions, largely loose and designed to get a feeling for how you relate to time at the
airport; what you would do if things were changed … if you could get here an hour ahead of
time instead of two would that change your habits, or would you still arrive two hours ahead
of time …
01:01 “No, no, I would cut it very fine if I could. I would. I remember in the days before all
this crazy security I would get to the plane just a minute or two before it was supposed to
take off. I would cut it very fine.”
Even for international?
01:28 “International probably not, although I did not have the money to travel
internationally back in those days, I was a uni student. So I don’t think I ever did that … yes,
probably not for international, I mean for international you are waiting at least 24 hrs if you
miss it [the flight]. There is a bit more gravity to missing the flight, whereas with flights
within the USA, if you miss a flight there will be another one within an hour or two anyway,
so it does not matter.”
There is a cost to being in Australia, everything from here is long haul, isn’t it?
02:02 “Yes … Fiji is not far, and New Zeland is only 3-4 hours away …”
I guess that compares to a domestic flight in the US?
02:18 “Yes, somewhat, but like my parents … it’s about a 10 hour drive to my parents house
[Boulder to Oklahoma], so I’d do it quite a bit, more often than I wish. Or the alternative, is
I could get a 1 hr flight.”
And you would still do the drive?
02:40 “Well yes … sometimes … because we are carrying babies, and bicycles and a
thousand other things, or whatever, and that just seems easier … but then, the real reason
is, by the time we leave our house, drive to the airport, unpack all the stuff at the parking
lot, take the little trolley into the airport, check-in, go through the security, blah blah blah
blah blah … door to door, from our house in Boulder to my parents house – we timed it one
time just to see – for a 1 hr flight, it took us about 6.5 hrs, all up, door to door … and you
know, we had to go through the whole rigermarole, be much more specific about what we
pack, and really thinking through what the baby needed … and we thought, for an extra 3.5
hrs, let’s just stuff all the things in the car, drive at our own leisure, stop and have an ice-cream if we want to, or whatever ... and it’s not entirely airport stuffing around, part of it is driving there, and whatever, but a lot of it, I mean at least 2-3 hrs of that is messing around at the airport, just for a little domestic flight.”

So I guess if that was sped up, I mean airports are bringing in all kinds of automation, with a view of speeding processing up ... maybe that would make it more convenient?

04:10 “Oh, absolutely! Certainly in the US I would be more inclined to do little trips here and there ... but here [Australia] ... where would I go? I mean Sydney, Melbourne or Perth, those are about your options. I mean sure, you could go to Cairns every now and then, but whatever, by and large I just don’t travel within Australia.”

Social chat about places to visit in Australia, PAX having lived here before in the past, weather, does not like the heat, etc

06:35 Check-in counter available, moves to there to get checked-in
07:05 If processing were faster, would definitely get to airport later
07:23 Sees airport time as overhead
07:41 Compared to driving: 1 hr flight had 6 hour door to door; driving was only 10 hrs ...total time of travel, not just the airport time - grouped together
08:41 If processing were faster, would be inclined to travel more; cultural preference for efficiency
09:12 Checking in 1 bag; 1 carry-on bag plus empty roll-on suitcase
11:10 Question regarding picking up bags at LAX and re-checking for a United flight to Denver
11:30 Check-in complete (6.5 mins waiting in line; 5 mins at counter)
11:31 What now?

“Security, I guess ... usually [hesitates], usually, ... I have to think about this airport, but usually I just go straight through security and deal with all the shops on the other side, but ... [trying to remember] ... but I can’t really remember how Brisbane airport works, most of the shops are on the outside here, aren’t they? ...”

Said that not that familiar with this airport, that would normally go straight through security but noted that here the shops are on the landside of security ... got a bit confused about what to do next; We start walking around, past RM Williams and Rip Curl

11:58 “I bought RM Williams down here once, because I was bored ...”

Social chat about RM Williams; UGG boots for kids; still walking around past shops, round the back to where the planes are visible; Walked around past Merino, looked out at planes;

13:32 “I think once [my wife] gave me a pass for the Qantas lounge, she used to have Qantas flyer club or whatever, so I think once I got to sit over there ... and I think that was over there [gestures] ... see, I can’t remember this airport that well, that’s the problem ... I can’t tell you what I typically do as I can’t remember [this airport]”

I sense that the passenger is somewhat uncomfortable about his lack of control over the environment; he can’t remember the airport very well, and is trying to cover up the fact that his is feeling a little uneasy. We are standing at the railing near the food court, looking out towards the planes; the passenger appears to be collecting his thoughts and trying to establish what to do next, without looking like he is unsure

14:04 “... Alright, can I buy you a cup of coffee at least?”

We start walking towards aromas; I decline the coffee; and remind the passenger to do his normal thing

14:14 “[nervous laugh] ... how do you collect this data, without affecting the data? Because ... normally I ... even now, just the fact that I am walking through the airport with someone else ... I do things in a slightly different way than if I was here totally on my own “
I explain that to the extent possible, I try not to influence what you do, and that he should do what he would normally do ... I sense that the passenger said this as he was slightly embarrassed about the fact that he was unsure about what to do, so tried to digress and put me on the defensive ... Sensed degree of unease as not completely familiar with environment ...

15:02 “I’ll tell you what I normally do ... I would probably go directly through security, because otherwise what I’ll end up doing is I’ll end up buying a coffee here, or something else out here, and end up having to take all that crap through security anyway ... so I’ll just probably ... I have 2 hours left [passenger is exasperated by the length of time left] ... this is the brutal thing about international flights ... I got here [to the airport] much faster than I expected because of the tunnel, I was counting on horrendous traffic to get here ...”

I remind the passenger that this is exactly what I am trying to do, see what he would normally do at the airport, that this is interesting to me

15:36 “So this is what I would probably normally do ... I would wander around and figure out how is this particular airport laid out, and how do I ... what is the most efficient way to get through here ...”

The passenger seems to be contradicting himself at this point, as earlier he claimed that his usual pattern is to proceed directly through security, and now he says that he would normally explore the airport and figure out the layout ... I think that he is largely trying to justify his unease and unfamiliarity with this particular airport, without seeming that he is not in control, or not an experienced traveler

We start walking past aromas, towards the departure escalators near the newsagent. Noted that has much more time at airport than expected, as thought traffic would be horrendous but tunnel was fast; Noted slight annoyance at having this extra time at the airport

15:45 “... I am an engineer, so I am always thinking about efficiency, right? OK, so, now I will try to figure out where to go ... over there right? [gestures towards yellow departure sign] That’s security. So, I’d say this is pretty normal, I’d look around and figure out is it better to spend time out here [landside] or in there [past security], but almost always I defer to in there ... because otherwise ... I end up with all this extra stuff, food or whatever, to take with me through [security] ...”

Social chat; trying to make the passenger feel at ease with me, and not make him feel like I sense his unease, reassure him that I am not trying to affect what he would normally do

17:00 We head down the escalator; passenger proceeds to go to counter to fill out his departure card

19:52 Passenger finished and starts walking towards pre-security area; there is confusion about whether to get a blue bin here, or in the security check line; passenger approaches security staff to ask

20:29 “Do I get a blue bin here or in there? ... Do I get my laptop out?”

Proceeds to take laptop and toiletries out of bag; toiletries have been pre-packaged in zip-lock bag at home

21:45 “This is so convenient to the last time we flew, we had [baby] and a cat ... and we were moving internationally ... this all seems so, ... very much less chaotic. I’m just going to casually get my stuff together here.”

I note that the passenger is making a deliberate effort to sound nonchalant: I sense that he is really feeling a little nervous and uncertain, does not have full control over what to do and where to go; I ask how the passenger knew to pre-pack his toiletries in a zip-lock

22:25 “I don’t know ... I travel a lot ... [nervous, uncertain laugh] ... do most people not [pre-
It was OK, it was ... no problem. I got stuck behind one family coming through so I got

Passenger emerges on the other side of customs and asks how I got there so fast; I tell

I wonder to myself why the passenger did not check the empty roller cabin bag, as he now

I note that the passenger appears a little uneasy about “not getting it right”, but trying to

I make my way to the other side of customs and wait

I note that the passenger felt the need to justify his “failures”

We proceed through first detector towards security; Unpacking things in preparation for going through security.

22:44 Passenger places zip-locked toiletries in tray; takes off shoes

22:46 “Domestically in the US ... like, I used to travel a lot for work, so ... it’s common [zip-lock bag] ... I even have a plastic belt that I wear so I don’t have to disrobe myself.”

Passenger shows me his plastic belt; places laptop and items in blue bins; I proceed through metal detector and wait on the other side

Passenger walks through, but sets detector off; removes something from pocket

Walks through again; sets detector off again; removes something from pocket

Walks through 3rd time without setting detector off: I sense that he feels a little uncomfortable about what just happened, that he was trying to appear like an experienced flyer, and setting the detector off would have made him appear “inexperienced”

After walking through, security approaches him about whether the bag just scanned belongs to him; he says yes and that it is OK for them to re-scan it

24:43 Bag rescanned (and then examined: laptop battery)

25:30 “I was taking it a bit too casually I guess, I was thinking ... I wore my watch with the rubber band, I wore my belt with the plastic buckle, I thought Oh, I’ll cruise right through today ... turns out I forgot about the coins, and keys and phones in my pocket.”

I tell the passenger that I will meet him on the other side of customs

We talk about plane features, and how old planes are so much worse ...

27:43 “Then again, Qantas is going broke, so what are you going to do ...?”

Social chat about the airline industry while passenger repacks bags after security

28:18 “When we lived in the states, I usually flew United, as Denver was the hub so that was the easiest at the time, to get the supply out of Denver ...”

Passenger has packed and we walk towards customs line. I tell the passenger that I will meet him on the other side of customs

28:28 I make my way to the other side of customs and wait

I note that the passenger appears a little uneasy about “not getting it right”, but trying to appear as a frequent traveler; note that he felt compelled to tell me a few times that he travelled a lot for work when he lived in Denver

I wonder to myself why the passenger did not check the empty roller cabin bag, as he now has a shoulder bag which he packs and repacks into the empty roll on bag

41:23 Passenger emerges on the other side of customs and asks how I got there so fast; I tell him that I have a special pass

41:23 “It was OK, it was ... no problem. I got stuck behind one family coming through so I got
sloowed down a little there, but I have been guilty of being that little family once or twice, so I have a bit more patience for that now than I used to.”
41:48 Replacing shoulder bag in the empty roller bag.
41:53 Stuck behind family, slowed things down but understanding empathetic
42:04 “Right!”
I say that I will follow the passenger
42:11 “First I am going to figure out which gate I am at, and I guess it says so right on my boarding pass … [looks at boarding pass] … 86 … [looks around to see whether to go left or right] … this way.”
We start walking to the right.
Social chat about American consumerism
42:23 Figuring out where gate is
43:05 “I think the point is that there is very little difference between the culture of Americans and Australians … and so these subtle things are the only real differences, so those are the sort of things that I pick up on I guess … the things you end up fixating on because there is nothing else that is dramatically different.”
We are making our way to the gate, but hot a dead end in the foodcourt and have to double back; I note again that the passenger tries to mask his discomfort about “getting it wrong”
43:25 “I am trying to go left … [seems confused at hitting dead end near foodcourt] … whereas in Bangkok, [the culture would be so different] that you would not be talking about whether shopping is open after 5:30pm, there would be other things to talk about how different the places were …”
We keep walking; passenger is thinking
44:17 “So I don’t know why I have this habit, whenever, as soon as I get through security I always walk to the gate wherever I fly out of … I don’t know why, because most of the time I know exactly where it is, and [when you get there] it’s just an empty gate waiting for people to get there … I always do that, and then [once I am there] I think I actually want a cup of coffee, so I just have to go back here … so I will probably do that today.”
We are still walking towards gate 86; social chat about research methods
45:17 “… oh, this is our gate right here … [confused] … but it’s not open yet? It is gate 86? [checks boarding card again] … I feel like I am missing something … but, oh well …”
I note that Gate 86 not accessible as there is an extra security check for US to get to that gate, which is currently closed. The passenger does not know this, he is unable to figure out why the gate is closed, he seems perplexed, checks his boarding card again … as he is unable to figure this out, he abandons this and we turn around and go back …
47:16 Looking for coffee; social chat about passenger’s profession: aerospace engineering; still looking for coffee
47:51 “I am looking for coffee but I keep getting stuck [in these other shops]”
We had walked past the coffee shop, past the pub, past the newsagent and to the duty free, and then turned around again back the way we came …
47:55 Found coffee shop
48:45 Ordered coffee, social chat about coffee types
48:55 Waiting for coffee
49:34 Got the coffee
50:16 Started walking back towards duty free … social chat about coffee types
50:54 “Now you’ve, … you’ve made me really think about what I do [at the airport] …”
Passenger seems unsure about what to do next; I reassure passenger to do what he would normally do, and not to be influenced by me being there
51:20 “… [my wife] told me to get some stuff in duty free, I don’t normally do that .. but it
seems now every time we come though I end up getting something at duty free ... I am actually going back to the US to attend a wedding ... I have a friend from New Zealand who runs mountain biking tours [talks about going back to help friend take a mountain biking tour in Colorado for Kiwis, and also attend the wedding] ...

52:25 “... This is the problem with sending a man to buy perfume ...

I ask if passenger knows what he is looking for, a brand perhaps?

52:27 “No, my wife just said get Sarah some perfume ... that was exactly what she said ... that’s all that I have to go on ... it would have to be a pretty universal one ...”

I suggest that the perfumes can be sampled

52:39 “[unsure where to start; looking around] ... the problem is that I am also trying to drink this coffee ... I really don’t know what I am doing with perfume, so I have been given a bit of an arduous task here ... [passenger considers calling his wife, but then realizes that she does not know Sarah very well either] ... mmm ...”

I tell the passenger that this is hard, as I really can’t involve myself in the process, so as not to affect what he would normally do ...

53:21 “... that’s OK, I’ll get the lady to help me, because that’s what I would do if you weren’t here... [looking around for a sales assistant] ... there has to be a lady around here somewhere ... [still can’t find any help] .. is it wrong to buy them just because they look nice? ...”

Passenger is struggling with where to start; no help has arrived from sales people; I suggest that perhaps there are some fragrances that are more universal, or popular ... I suggest that we wait for the sales assistant

54:12 “I’ll do what I would normally do, which is wait for the sales assistant.”
Sales assistant come over

54:24 “Yes, could you please [help]! I am headed to the US for a wedding, and my wife has instructed me to buy the Bride some perfume.”
Sales assistant suggest that he gets something popular; something with wide appeal; she suggest Givenchy as it is a good brand; a quality brand; best to get a quality brand. She proceeds shows passenger some popular perfumes.

There is some confusion about me being the wife; I explain that I’m interviewing and not involved in the perfume selection process; we joke that I would tell him what to get if I were the wife

55:48 “… it’s not that [reluctance about the suggestion that the sales lady has made] ... it’s just that I feel a little weird about giving my friend’s wife something called IRRESISTIBLE ...”
Sales lady gets some clarification about who the gift is actually for: the bride of passenger’s friend, not passenger’s wife

56:03 “The gift is from my wife, to his wife ... I have been given wrapping paper and a card [in my suitcase] and was told to get some perfume”

57:25 Testing all perfumes now; looking for something popular ... found one that says I love you on the bottle ...

58:12 “… I love you is better than simply irresistible [on the bottle] ... [we all laugh] ... “

60:07 Considering packaging; finally chose bvlgari perfume

60:16 “Ok, perfect, I think I will get this one, this 50ml version ...”
Walking towards check-out; don’t need anything else

60:47 “Probably should have got the 100ml ...”
Passenger undecided about whether he has made the right choice

61:37 “I am just rethinking about which of the two [perfumes] I wanted ...”

61:47 Went back to double check making right choice; but kept bvlgari

61:45 “I am going to stick with this one.”
We move out of the Australian souvenir shop and wander into the ugg boot/merino wool store next door; look at baby UGG boots; social chat about kids, etc; looking at the RM Williams; trying to pass the time …
70:54 “... Not that I would buy anything, I am looking for something to spend some time looking at ...”

We walk over to the newsagents; we talk about the airport in Brisbane being small; I try to steer the conversation onto whether the airport is small, or whether it is well designed, and therefore does not feel too complex ...

71:25 “… that is a good question ... I don't know either ...”

71:56 Looking for things to look at, wandering in and out of shops; we end up in the magazine isle at the newsagency

72:30 “I must admit, this is almost always what happens ... I look around for a while for something to entertain me, and I eventually end up in the magazine section ... it's bad to have this oversight on what your habits are, because you realize, OH, this what I actually do pretty much every time ... it is wasted time though ... we are creatures of habit ... [reflects] .. yes, this is what I do when I am at the airport ... yes, and I always know, no matter what airport I go to, that I will find a mountain biking magazine, of some sort, in the magazine rack ...”

Observation: Finding comfort in the familiarity, even though one is in an unfamiliar environment, no one flies every day, it's an unfamiliar environment to everyone, those patterns that people tend to repeat give a sense of familiarity: it makes even a foreign place, like an airport you have not been to before, seem familiar ... it is almost like McDonald's, the pattern that you have at the airport, is almost like finding a McDonald's in a foreign country – you don't eat there because you like it, you eat there because it is familiar, and you know what to expect.

I ask: you said that you normally come straight down to security after check-in, what are your reasons for that?

73:50 “I guess the reason is that security can be so variable, like sometimes you fly right through, like today was reasonably quick, other times you can get caught in that queue which can take forever ... now, I'm not familiar enough with this particular airport to know that I am going to get through there every time very quickly, but I think my experience ... thinking back to it, every time I have come through Brisbane there has been hardly any line, and I have some through very quickly. But, I have experience in other airports that tells me that sometimes, things get really terrible, and you are in line for security for an hour so, you'd better get there, and get through it, just to make sure that [you are through] ... because otherwise, I can't sort of relax, and ... because I am thinking OK, I have to keep an eye on my watch because I have to leave enough time to get through security, and get to my gate ... now I know, that if I had to, I could run down to that gate [86] in three minutes, because I know exactly where it is ... which is I guess why I go down there and check out exactly where it is, so that I know where I am going if I have to get there [fast] ... if I look at my watch and I realize OH, crap, they are boarding right now, [I can get there] ... I guess that's why I come through security first, just so I know that I don't have anything else standing in my way of getting there [to the gate] when the time comes ... because I am not the type of person who typically goes down there and sits there for an hour, reading my book, or playing on my computer or whatever, a lot of people do that sort of stuff, ... I like to come out here [shops] until I know it's about to start boarding, or I see it on the board OH ok we're boarding, or until I hear them talk about it, like flight whatever is about to board ... I try not to leave it until the last minute”.

76:15 Social chat; at the magazine racks

81:16 We start walking slowly back towards the gate (from the newsagent near Qantas
club); stop to look at the large departures display board
228

81:16  “Oh look, are we boarding? Boarding in 30 minutes ... oh man! ... we are not killing enough time here ...”

We continue walking slowly towards gate 86
82:23  “What I’m going to do is call [my wife’s dad] ... so I’ll go and sit at the gate ... kill a little more time doing that ...”

I say that’s fine, that I will walk passenger down there and leave him to it (give him some privacy for making the phone calls); we keep walking; more social chat about his wife; we encounter a school trip
85:15  “[confused] I am sure it said gate 86? ... yeah ... I can’t seem to get down there, it is blocked up ...”

As the passenger is unable to figure out what is going on, I tell him that there is a second security check down there, as he is going to the US
85:27  “Oh, that’s why everyone is sitting around here (at gate 84/85) ... there seems to be no-one else from my flight down there (at 86) ... oh well, this is fine, I’ll sit here, close enough”

I tell the passenger to take his time making his phone calls, and I will stand aside to give him some privacy; passenger proceeds to sit down and make phone calls; I observe a group of students (maybe young UN group from the USA) all congregating at gate 85
89:53  Second security check is now open, big line and everyone rushes there
97:40  I note that this passenger has not spent much time handling his passport
98:47  Stands up, ready to approach security line but still on the phone
Social chat
119:54  We say our goodbyes, I thank passenger
Going through security gate: 30mins to go to departure

Observations:

Relationship to airport time is minimalist; efficient
Values efficiency
Sees time at the airport as “wasted” – waiting is “killing time”
Looks for things to entertain him, to pass the time
Views purchasing things at the airport as a last resort, an indication that the purchase was not well thought out
Does not view airport shopping as being good value, or necessarily “genuine”
If processing was faster, would definitely get to the airport later ... but, airport time is affected by the total door to door time (i.e. if getting to the airport takes longer/shorter than expected, it affects your time at the airport)
Values appearing in control of environment
Values appearing experienced
Uncomfortable/uneasy/defensive when is unsure about what to do/where to go
Feels the need to justify why certain actions are taken
Familiar patterns: provide sense of control and familiarity in an unfamiliar environment; reduce uncertainty – for this passenger, the pattern of going through security, going to the gate, returning to buy a coffee, getting any prescribed duty free items, strolling around and finding mountain biking magazines to read provide a familiar pattern and reduce his uncertainty about being in an environment that he is not familiar with.
## Appendix L: Triangulation of data

Field study one data re-coded with field study two coding scheme (triangulation data set).

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<th>Time Sensitivity</th>
<th>Engagement</th>
<th>Travel Proficiency</th>
<th>Purpose of Travel</th>
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1=Time sensitive, 0=Not time sensitive
2=Engaged, 0=Not engaged
Appendix M: Mathematical foundations for models presented in this thesis

The models presented in this thesis are based on underlying mathematical relationships. These relationships are presented in this Appendix as a series of Equations. Each Equation is cross-referenced to the corresponding model in the thesis.

Equations corresponding to models in Chapter 2

Equation 1: Terminal Size (LOS)

\[
\text{Terminal Size} = f (\text{TIME, SPACE, PROCESS}) \times \text{NUMBER PAX}
\]

\[
= \text{LOS}
\]

where \(\text{TIME}\) is the amount of time, and \(\text{SPACE}\) is the amount of space that is allocated for each passenger for each \(\text{PROCESS}\) (check-in, security, customs, boarding, retail), and \(\text{NUMBER PAX}\) is the total projected number of passengers to be accommodated in the terminal building.

This equation underpins the model in Figure 3.

Equations corresponding to models in Chapter 3

Equation 2: Staged Experience

\[
\text{Staged Experience} = f (\text{TIME(objective)}, \text{SPACE, PROCESS})
\]

where \(\text{TIME(objective)}\) is an objective measure of time (minutes), \(\text{SPACE}\) is an objective measure of recommended space per passenger (m2), and \(\text{PROCESS}\) refers to one of the four necessary activities in international departures (check-in, security, customs, boarding).
This equation underpins the model in Figure 13.

**Equation 3: Public Experience**

\[
Public \text{ Experience} = \sum f(Satisfaction)
\]

where *Satisfaction* is a measure of the collective satisfaction of all passengers (Equation 7).

This equation underpins the model in Figure 14.

**Equation 4: Past Experience**

\[
Past \text{ Experience} = f(Satisfaction, Past \text{ Experience}, Public \text{ Experience})
\]

where *Satisfaction* is a measure of the satisfaction of a passenger’s experience (Equation 7), *Past Experience* represents the passenger’s past experience (Equation 4), and *Public Experience* is the collective experience of other passengers (Equation 3).

This equation underpins the model in Figure 15.

**Equation 5: Expected Experience**

\[
Expected \text{ Experience} = f(TIME(subjective), Past \text{ Experience}, Staged \text{ Experience})
\]

where *TIME (subjective)* is a passenger’s interpretation of time, as moderated by the experience itself (Equation 13), *Past Experience* is the past experience of the passenger (Equation 4), and *Staged Experience* is the actual experience offering (Equation 2).

This equation underpins the model in Figure 16.
Equation 6: Perceived Experience

\[
Perceived \ Experience = f (TIME(\text{subjective}), \\
Expected \ Experience, Staged \ Experience)
\]

where TIME(\text{subjective}) is a passenger’s interpretation of time, as moderated by the experience itself, Expected Experience is the expected experience of the passenger (Equation 5), and Staged Experience is the actual experience offering (Equation 2).

This equation underpins the model in Figure 17.

Equation 7: Passenger Satisfaction

\[
Satisfaction = Perceived \ Experience - Expected \ Experience
\]

where Perceived Experience is the perceived experience of the passenger and (Equation 6) Expected Experience is the expected experience of the passenger (Equation 5).

This equation underpins the model in Figure 18.

Equations corresponding to models in Chapter 7

Equation 8: Public Experience

\[
Public \ Experience = \{\text{WILL TRAVEL} | \text{WILL NOT TRAVEL}\}
\]

where WILL/WILL NOT TRAVEL represents a Boolean value (true or false) indicating whether the passenger will or will not travel from a given airport (based on the collective opinion of other travellers).
This equation underpins the model in Figure 41.

**Equation 9: Past Experience**

\[
\text{Past Experience} = \text{UNCERTAINTY FACTOR}
\]

where UNCERTAINTY FACTOR is a value representing the time (positive or negative) that the passenger applies to offset the recommended airport arrival time when travelling from a given airport.

This equation underpins the model in Figure 42.

**Equation 10: Passenger Segment**

\[
\text{Passenger Segment} = f (\text{Level of Engagement}, \text{Time Sensitivity})
\]

\[
= f (\{\text{ENGAGED} \mid \text{NOT ENGAGED}\},
\{\text{SENSITIVE} \mid \text{NOT SENSITIVE}\})
\]

where *Level of Engagement* represents a Boolean value (true or false) (\{ENGAGED or NOT ENGAGED\}) indicating whether the passenger is engaged or not engaged in the airport environment, *Time Sensitivity* represents Boolean value (true or false) indicating whether the passenger is or is not sensitive to time in the airport environment (SENSITIVE or NOT SENSITIVE).

This equation underpins the model in Figure 39.

**Equation 11: Definition of each passenger segment**

\[
\text{Airport Enthusiast} = \text{Passenger Segment (ENGAGED, NOT SENSITIVE)}
\]

\[
\text{Time Filler} = \text{Passenger Segment (NOT ENGAGED, NOT SENSITIVE)}
\]

\[
\text{Efficiency Lover} = \text{Passenger Segment (NOT ENGAGED, SENSITIVE)}
\]

\[
\text{Efficient Enthusiast} = \text{Passenger Segment (ENGAGED, SENSITIVE)}
\]

where *Passenger Segment* is as defined in Equation 10, and ENGAGED, NOT ENGAGED, SENSITIVE and NOT SENSITIVE are as defined in Equation 10.
This equation underpins the model in Figure 39.

**Equation 12: Expected Experience**

\[
\text{Expected Experience} = f(\text{Passenger Segment}, \text{Past Experience}, \text{Staged Experience}, \text{MAKE FLIGHT})
\]

where *Passenger Segment* is the mode of passenger engagement in the airport environment (Equation 10), Past Experience is the past experience of the passenger (Equation 9), *Staged Experience* is the objective experience offering (Equation 2) and MAKE FLIGHT represents a Boolean value (true or false) indicating whether or not the passenger feels that they will make their flight.

This equation underpins the model in Figure 44.

**Equation 13: Time (subjective)**

\[
\text{TIME}(\text{subjective}) = f(\text{ARTEFACT, SERVICE, ENVIRONMENT}, \text{TIME}(\text{objective}), \text{WAITING PLACE})
\]

where ARTEFACT is the effect of interacting with artefacts on the perception of time, SERVICE is the effect of service on the perception of time, ENVIRONMENT is the effect of the environment on the perception of time, TIME(objective) is an objective measure of time in minutes (Figure 7), and WAITING PLACE is a value which moderates the perception of TIME(objective) by the passenger’s expectations that the airport is a place for waiting (and queuing).

This equation underpins the model in Figure 45.
Equation 14: Perceived Experience

\[ \text{Perceived Experience} = f(\text{Passenger Segment}, \text{TIME(subjective)}, \text{MAKE FLIGHT}) \]

where \text{Passenger Segment} is the mode of passenger engagement in the airport environment (Equation 10), \text{TIME(subjective)} is the passenger’s interpretation of time (Equation 13), \text{MAKE FLIGHT} represents a Boolean value (true or false) indicating whether or not the passenger feels that they will make their flight.

This equation underpins the model in Figure 46.

Equations corresponding to models in Chapter 8

The equations presented in chapter 8 are derived from Equations from Chapters 2, 3 and 7.

Equation 15: Passenger Footprint

\[ \text{Passenger Footprint} = f(\text{TIME}, \text{SPACE}, \text{PROCESS}) \]

where \text{TIME}, \text{SPACE} and \text{PROCESS} are as defined in Equation 1.

Equation 16: Passenger footprint for a given passenger i

\text{Passengers who are time sensitive will take up less space, while passengers who are not time sensitive will take up more space. For a given passenger i, their footprint in the terminal building is therefore, in part, determined by their sensitivity to time.}
where \( i \) refers to a given passenger, \( \text{Passenger Footprint} \) is as defined in Equation 15 and \( \text{Adjustment Factor}(i) \) is as defined in Equation 17.

**Equation 17: Adjustment factor for a given passenger \( i \)**

\[
\text{Adjustment Factor}(i) = \text{Time Sensitivity Adjustment}(i)
\]

where \( \text{Time Sensitivity Adjustment}(i) \) for a given passenger \( i \) is as defined in Equation 18.

**Equation 18: Time sensitivity adjustment for a given passenger \( i \)**

*Increase represents a positive adjustment factor (larger footprint) if passenger \( i \) is not time sensitive, Decrease represents a negative adjustment factor (smaller footprint) if passenger \( i \) is time sensitive, and Passenger Segment is as defined in Equation 10.*

\[
\text{Time Sensitivity Adjustment}(i) = \{ \text{Increase}(i \in \text{Passenger Segment}(\cdot, \text{NOT SENSITIVE})) | \text{Decrease}(i \in \text{Passenger Segment}(\cdot, \text{SENSITIVE})) \}
\]

where \( \text{Increase} \) represents a positive adjustment factor (larger footprint) if passenger \( i \) is not time sensitive (NOT SENSITIVE), \( \text{Decrease} \) represents a negative adjustment factor (smaller footprint) if passenger \( i \) is time sensitive (SENSITIVE), and \( \text{Passenger Segment} \) is as defined in Equation 10.

*From Equations 15, 16, 17, and 18, the definition of terminal size (Equation 1) can now be re-stated as Equation 19.*
Equation 19: Terminal size, adjusted for time sensitivity

\[
\text{Terminal Size} = f (\text{TIME, PAX FOOTPRINT}) \times \text{NUMBER PAX} = \text{Passenger Footprint} \times \text{NUMBER PAX} = \sum_{i=1}^{\text{NUMBER PAX}} \text{Passenger Footprint (i)} = \sum_{i=1}^{\text{NUMBER PAX}} \text{Passenger Footprint (i)} \times \text{Adjustment Factor (i)} = \sum_{i=1}^{\text{NUMBER PAX}} \text{Passenger Footprint (i)} \times \text{Time Sensitivity Adjustment (i)}
\]

Equation 20: Adjustment factor for a given passenger \(i\)

For a given passenger \(i\), their footprint in the terminal building is determined by their degree of engagement and also their time sensitivity in the terminal building. Therefore, extending Equation 17 results in Equation 20.

\[
\text{Adjustment Factor (i)} = \text{Time Sensitivity Adjustment (i)} + \text{Engagement Adjustment (i)}
\]

where for a given passenger \(i\), \(\text{Time Sensitivity Adjustment(i)}\) is as defined in Equation 18, and \(\text{Engagement Adjustment(i)}\) is as defined in Equation 21.

Equation 21: Engagement adjustment for a given passenger \(i\)

\[
\text{Engagement Adjustment (i)} = \text{Increase (i } \in \text{Passenger Segment (ENGAGED, -))} \mid \text{Increase (i } \in \text{Passenger Segment (NOT ENGAGED, NOT SENSITIVE))} \mid \text{Decrease (i } \in \text{Passenger Segment (NOT ENGAGED, SENSITIVE))}
\]

where \(\text{Increase}\) represents a positive adjustment factor (larger footprint) if passenger \(i\) is engaged in the airport environment, or if the passenger is not engaged and not time sensitive, \(\text{Decrease}\) represents a negative adjustment factor (smaller footprint) if passenger \(i\) is not engaged in the airport environment but is time sensitive, and \(\text{Passenger Segment}\) is as defined Equation 10.

From Equations 20 and 21, terminal size (Equation 19) can now be re-stated as Equation 22.
Equation 22: Terminal size, adjusted for time sensitivity and engagement

\[
\text{Terminal Size} = \sum_{i=1}^{\text{NUMBER_MAX}} \text{Passenger Footprint}(i) \times (\text{Time Sensitivity Adjustment}(i) + \text{Engagement Adjustment}(i))
\]

Equation 23: Potential revenue from a given passenger i

As engagement is a necessary pre-cursor to spending (Livingstone, 2014), it follows that only the engaged portion of passengers have the potential to generate revenue. Note that from the principle of inconsistency, all engaged passengers are not time sensitive.

\[
\text{Potential Revenue}(i) = \begin{cases} 
\text{Positive}(i \in \text{Passenger Segment}(\text{ENGAGED}, \text{NOT SENSITIVE})) \\
\text{Zero}(i \notin \text{Passenger Segment}(\text{ENGAGED}, \text{NOT SENSITIVE})) 
\end{cases}
\]

where Positive represents a potential revenue greater than zero if passenger \(i\) is engaged in the airport environment (ENGAGED) and is not time sensitive (NOT SENSITIVE), Zero represents a zero return if the passenger is either not engaged (NOT ENGAGED) or is time sensitive, and Passenger Segment is as defined in Equation 10.

Equation 24: Return on passenger footprint for a given passenger i

\[
\text{Return on Passenger Footprint}(i) = \frac{\text{Potential Revenue}(i) - \text{Cost(Passenger Footprint}(i))}{\text{Cost(Passenger Footprint}(i)}
\]

where Potential Revenue(i) is as defined in Equation 23, Passenger Footprint(i) is as defined in Equation 16, and Cost is the cost of delivering the amount of space occupied by passenger \(i\).

From Equation 23 and 24, it is clear that if the Potential Revenue (i) is not positive, the returns on the terminal footprint invested for passenger \(i\) will be negative.
Equation 25: Net return on terminal footprint invested

A reduction in passenger footprint implies a reduction in the cost of delivering the amount of space required by the passenger in the terminal building (Equation 24). From Equation 24 it is evident that a reduction in the cost of delivering a given passenger footprint will have the net effect of increasing the return on passenger footprint invested.

The net return on passenger footprint invested is therefore a trade-off between increasing costs and revenues (retail expansion), and decreasing costs by reducing the total amount of time in the terminal building per passenger (automation and self-service).

\[
\text{Net Return on Terminal Footprint} = \sum_{i=1}^{\text{NUMBER PAX}} \text{Return on Passenger Footprint} (i)
\]

where \text{Return on Passenger Footprint} (i) is as defined in Equation 24.
Appendix N: Example use of principles for planning

The six principles of experience design presented in Chapter 8 can be used to assist airport planners in optimising space allocation in airport terminals on the basis of passenger behaviour.

The example presented assumes the distribution of passengers as per the research airport (Figure 39): (i) 35% Airport Enthusiasts (engaged and not time sensitive); (ii) 48% Time Fillers (not engaged and not time sensitive) and (iii) 17% Efficiency Lovers (not engaged and time sensitive).

Assuming this distribution of passengers, the net return on terminal footprint invested is calculated as shown in Figure 54. The Potential Revenue for this terminal is based on only 35% of passengers: recall that only the Airport Enthusiast category of passengers engages in, and therefore spends, in the airport environment. In other words, 65% of the passengers at this airport will not generate any revenue. As a result, the maximum revenue is 35% of what it could be if every passenger was spending. For simplicity, it is assumed that all passengers potentially spend the same amount in retail (i.e. average passenger spend).

The cost of delivering the space required by all the passengers, Cost(Passenger Footprint), is 132% the average (LOS) allocation of passenger footprint. This increase in footprint allocation can be attributed to: (i) the Time Sensitivity Adjustment applied to proportion of passengers who are not time sensitive (35% plus 48%), but is offset by the passengers who are time sensitive (17%); and (ii) the Engagement Adjustment applied to proportion of passengers who take up more space (35% plus 48%), but is offset by the passengers who take up less space (17%).

Based on this distribution of passengers, the net return on investment on the terminal footprint at the research airport is negative (Figure 54). The negative return can be attributed to the large proportion of passengers who are not time sensitive and do not engage in the airport environment (48% Time Fillers). These passengers take up space, but do not generate any revenue from their time in the airport.
The total returns on investment would be improved if the passengers currently in the Time Filler segment could be shifted into either the Airport Enthusiast (higher yield) segment, or into the Efficiency Lover (smaller footprint) segment. Strategies for effecting this shift will be discussed in the following section (Section 8.8).

Generalizability of this example

The derivation of the net return on terminal footprint investment in the example presented in this appendix is dependent on the particular distribution of passengers in the airport. In other words, the mix of passengers in each of the segments Airport Enthusiast, Time Filler and Efficiency Lover (Figure 39) at a particular airport will impact the net returns of that airport.

Although the specific ratio of passengers in each of the four sectors would need to be confirmed through localised data collection, it is likely that many airports will follow the same general pattern of passenger distribution. As an example, research conducted by a private international research company has shown that in the Asia-Pacific region 36% of passengers actively engage (spend) in the airport terminal,
while in Europe only 30% of passengers actively engage (Research for Travel, 2012). By comparison, the figure was 35% of passengers in this research. The proximity of these results when compared against these independent and geographically diverse data sets provide some confidence that the passenger distribution figures from this result may be generalizable.

The results of the example in this appendix are also dependent on two other factors: the cost of delivering the passenger footprint, and also the average passenger spend in the terminal. It is possible that if the cost per square metre of space in the terminal is low enough, and the average spend per passenger is high enough, that the actual return on investment will be positive, even if the potential returns per passenger footprint are negative. This is unlikely to be the case, however, given the low profit margins reported in the aviation industry over the last several decades (IATA, 2013b; Newton, 2013; The Economist, 2014).

The traditionally low profitability in the aviation sector has been related to the significantly large infrastructure costs of terminal expansion. These large infrastructure costs are seen as an “investment” on which the annual returns are quite low. The outcomes of this research shed light on a potential factor contributing to the low returns in aviation: the large proportion of passengers who consume terminal space but do not generate any revenue from their allocated footprint.