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Regional airline-rail alliances as a competitive strategy for airports

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Abstract

There are currently 182 airport-rail links worldwide, with more being built every year (IARO, 2012). The focus of these links, and the current associated literature is generally on high-speed rail and CBD-centric services. The purpose of this study was to determine whether the relationship between airports with regional airline-rail alliances resulted in a relatively more successful competitive strategy than those airports without such relationships. Using a comparative case study method, four airports were analysed to address this question. Firstly, the study uses Porter's (1979) five forces model to analyse industry competition. Several common factors were discovered that drive the strategies in each of the four case studies. Secondly, the study found that the successful case studies have strategic options that are aligned with Porter's (1980) model of three generic competitive strategies. Finally, funding support from central government is essential to the building and sustainable operation of all four of the case studies. The study concludes, that regional airline-rail alliances are beneficial to airports as a competitive advantage, provided the political support for infrastructure investment is present.

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Statement of Academic Integrity

I declare that this research report is entirely my own work. When the ideas, quotations, data and diagrams of others have been used in the report, the work has been properly cited in the text.

12 November 2012

Signature Date

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Glossary

CBD – Central Business District
EC – European Commission
EU – European Union
HSR – High Speed Rail
IARO – International Airport Rail Organisation
IATA – International Airline Transport Association
LVC – Land Value Capture
mppa – Million Passengers Per Annum
PPP – Public Private Partnership
SBB – Swiss Federal Railways
VOT – Value of Time

Chapter 1: Introduction and Background

Introduction

Airlines, rail and other transport modes are currently embroiled in a search for competitive advantage and initiatives toward efficiencies. A common method of achieving competitive advantage and efficiencies is to enter into strategic alliances with other airlines (Doganis, 2006). There are many types of alliance models varying from commercial to strategic ends of the spectrum. In practical terms, these alliances have allowed airlines to expand the network available to passengers and reduce the expenses of shared services.

This study suggests a further pathway to competitive advantage is through strategic alliance with rail access; regional rail in particular. Regional access by passengers on rail, will allow the airline to redirect those aircraft previously used on the short haul regional routes to more profitable longer haul services (Givoni, 2005). While this alliance may benefit the airline and rail companies, it may also create a competitive advantage for the airport.

The airline and rail companies could be viewed as suppliers to the existing airport industry competition. While some airports may be seen as a monopoly, all airports are in some form of competition with each other. Large airports such as Frankfurt and Heathrow compete with each other for hub status. They and smaller airports compete for origin and destination passengers with other airports in their catchment areas (Redondi, Malighetti, & Paleari, 2011). An airport using rail as a supplier will create an advantage within the catchment area, compared to an airport that does not have a rail-link.

To allow rail to become a supplier to the airport, an airport-railway link must be built. As of November 2012, 182 airport rail-links existed in some form (IARO, 2012). Eighty-five of those were built in the last decade, and many more are under-construction or being planned. Primarily, these links have been built as a mass transport mode of surface access for passengers and staff (IARO, ATAG, & ACI, 1998). But, there is potential to expand this role of rail to beyond this CBD-centric focus. They can be an integral part of an airlines route network and be a major attraction for the airport over other airports in the region. Of the existing airports with rail access, 69 are on a regional rail route (IARO, 2012).

Building this rail infrastructure is the most efficient method of transporting large numbers of passengers, staff, and ‘meeter-greeters’ to airports. The sheer number of people who can be transported on a single train is far greater than any other transport mode that requires road lanes. Some airports have been so successful in the implementation of airport rail-links, the rail line can pay entirely for its own operating and capital investment costs (Tang, Chiang, Baldwin, & Yeung, 2004). Other airports achieve significant modal share of ground transport by rail, as high as 66.5% (Flughafen Zürich, 2012). However, although the development of airport rail-links has been increasing over the last decade, not all have been great success stories. Some have been hampered by woeful over-forecasting of patronage or have limited services and offers for passengers to choose from. While so many airports are looking to build infrastructure for rail-links, it is important to study and understand what makes a successful airport rail-link and what has been tried and failed.

Building the infrastructure may be a positive strategy, but if the infrastructure is not fully utilised it could become a burden on finances, often the Government’s. There are several different models of rail-links at many international airports with the required infrastructure.

Metropolitan rail services are the most common (IARO, et al., 1998), however, there are other unique models in use at various airports that may enable further growth, not only of the service itself, but also the airport's catchment area.

Research into the benefits of various models has recently begun to surface. As will be outlined in the literature review, there are many studies that have already been undertaken in Europe. However, they have tended to centre around high speed rail (HSR) as competition to airlines on the 200 – 300km distance market as part of an alliance (Givoni, 2005). There is also limited research on metropolitan and light rail transit services, but one particular area with little to no research is non-HSR regional rail[1] and it is highlighted in this study as a research gap.

The passenger experience with intermodal travel has also been well researched (Cokasova, 2006; Kouwenhoven, 2008) and can provide this study with an excellent guide on how to understand the passenger experience in regional rail. The two areas under-researched are regional rail networks that are connected to airports and airline-rail alliances.

Understanding these regional airline-rail alliances are required now before any more airport rail-links are built. This will help to ensure these links have the best chance of success from day one. It will also provide different strategy options for extending current airport rail-link services. Airlines, airports, and rail companies need to understand the impact of such services and their potential to influence and benefit each other.

The benefit of conducting this study is the discovery of common successful strategies. If these strategies can be generalised, they may be implemented by new and existing airport rail-links. Traditionally this infrastructure was built by government to enable mass transport access to mass transport hubs (airports) as a public service. Now however, commercial business cases must validate the need for such services. This study will satisfy the need to understand the potential of regional rail services, which is available in many regions of the world.

Purpose

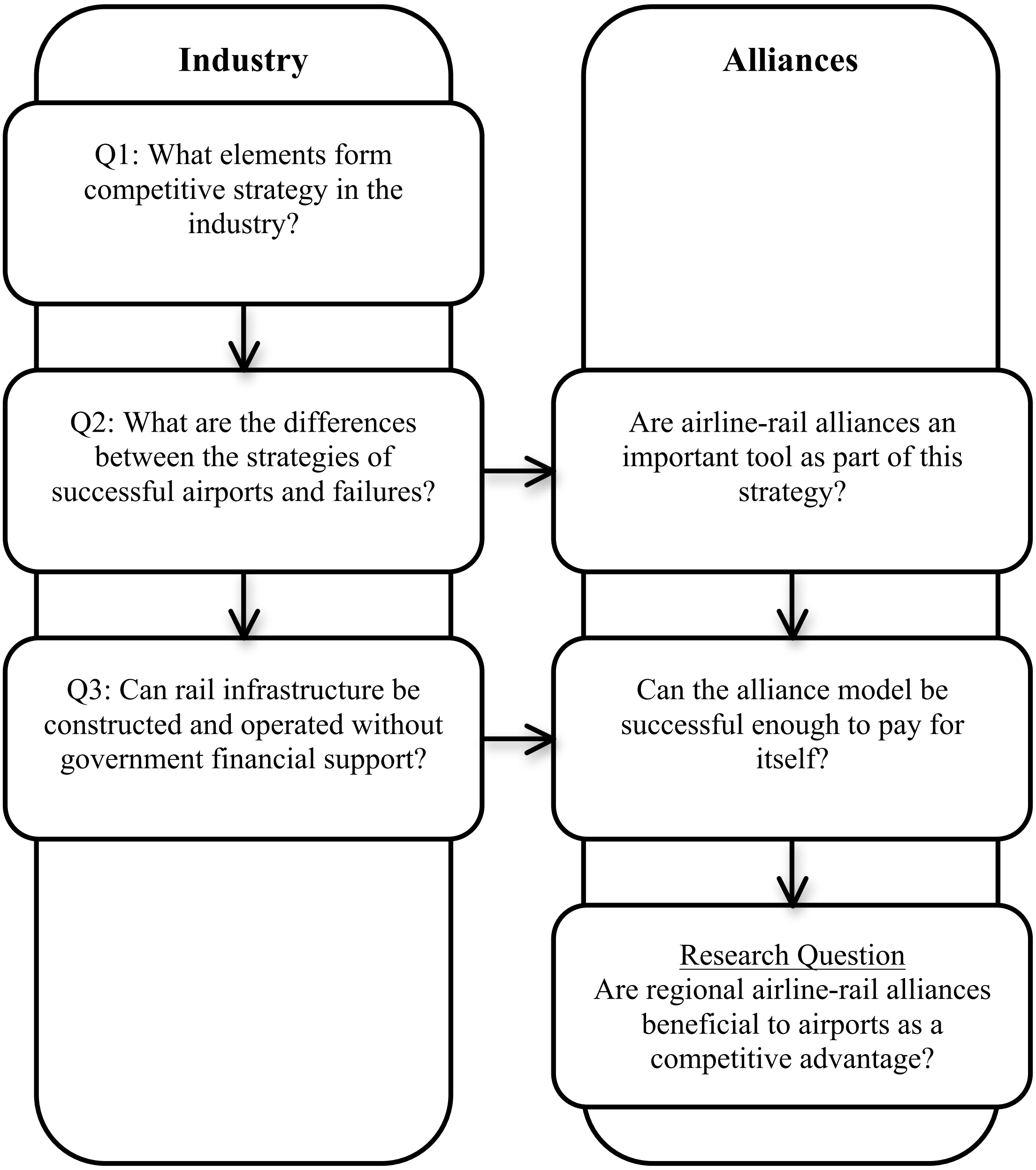
The purpose of this study is to find a correlation between the strategies of successful airports with airport rail-links, and whether regional airline-rail alliances could adopt a similar strategy that would result in success. These findings will also help plug the gap in literature where this research is currently missing. The prime research question therefore is *"Are regional airline-rail alliances beneficial to airports as a competitive advantage?"* To answer this question, this study will address three ancillary questions as shown in Figure 1. These three ancillary questions not only address the research question, but also provide an understanding of other influences that affect the industry as a whole.

Before any analysis can be carried out, an understanding of the elements that can influence the industry is required. This includes competition, politics, and the passenger experience. These elements are required to be understood in order to position the strategy to achieve the

[1] The term regional rail will refer to non-HSR throughout the rest of this study.

best competitive outcome. From this general industry wide understanding, the elements can be used to understand the various strategies in industry.

Figure 1: Structure of Ancillary Research Questions



Source: Author

The second question is to understand these differences in strategy being used. Understanding the differences between the successful strategies being employed and those that are unsuccessful are needed to find whether any correlation exists between them. From this, the study will aim to understand if alliances play a key role in successful strategies.

The third question is to understand funding models. This will again be viewed from the point of view of the airport and whether the alliance can contribute to, or pay for, the infrastructure. While the study may find a correlation between the successful and unsuccessful strategies, the transport industry is heavily affected by political decisions and governments often face expensive construction costs.

From these questions, the prime research question can be answered on whether regional airline-rail alliances can achieve competitive advantage. Simultaneously, the answer will have been developed in the context of the whole industry and is therefore able to be generalised enough to support new builds and remediate struggling cases.

Background

This background section will now outline the basic theory of air-rail interaction. This will provide the context of the industry in order to better understand the unique and often complex models of interaction discussed throughout the rest of the study.

Strategy

The concept of strategy is not new; man has been strategising for millennia. Even before the Romans, warlords would plan strategies for their armies to conquer and defend themselves from others. By World War Two, strategy had become as grand and complex as how to obtain world domination. Business strategy however, and the academic theory behind this, lagged significantly behind the military. Now corporate strategy is extremely popular, with thousands of articles published in various journals and books lining the shelves of libraries and stores. But, *"if the secrets of corporate strategy could be acquired for £25 then why would we pay our top managers so much?"* (Whittington, 1993, p. 1). Even amongst these books there are differing views on what strategy actually is.

Influential academics such as Mintzberg and Porter have emerged since the 1980's with theories on business strategy. Whittington summed up their different views on strategy with his four processes of strategy formation; classical, evolutionary, systematic, and processual (Whittington, 1993). The classical approach will be used in the context of this study and is explained further below. The other three, while valid approaches to strategy, do not necessarily allow for a profit driven, forward planning approach.

The classical approach to strategy is where profitability is the supreme goal of business. Its origins as a structured discipline come from the writings of businessman Alfred Sloan, theorist Igor Ansoff, and historian Alfred Chandler. These leaders helped define the key features of the classical approach as the attachment to rational analysis, the separation of conception from executing and the commitment to profit maximisation (Whittington, 1993). This separation of conception from execution aligns to organisational structures. This allows top management the time, independence, information and even psychological position to strategize (Chandler, 1994). This allows operational department managers to execute these strategies – a top down approach. In the classical strategic approach, top managers would develop the basic long-term goals, processes, and allocation of resources to try to place the company in a profit maximising position. This study will find successful strategies to provide industry with new ideas to plan their future. Therefore, the classical method will be used throughout this study.

The Role of Rail in Aviation

Prior to addressing the alliances between airlines, airports, and rail, one must have an understanding of the role of rail in aviation. It may not be immediately apparent that there are benefits to be had from creating alliances between the two transport modes.

Historically, land developed during World War Two has dictated the location of airports. These areas did not necessarily have rail access, or even major roads. Airports were simply an area to land and take-off aircraft, with the provision of a simple passenger terminal (Sander, 2004). During the middle of last century, the development of the car meant that highways were threaded through our suburbs to these airports in line with the development of air travel, but rail was in decline as a transport mode and little development was done to supply rail-links (Kasarda & Lindsay, 2011).

Those early days of airport development were somewhat haphazard. Now as our cities grow, public pressure is slowly moving airports to our outer fringes (Kasarda & Lindsay, 2011). Yet, the airport is the heart of economic activity – a necessary asset in any successful city (Kasarda & Lindsay, 2011; Sharp, 2004). Some airports throughout the world have realised this and have built their cities with the airport as the focal point (Kasarda & Lindsay, 2011). These airports are surrounded by valuable warehousing, office space just a walk to the plane, and residential areas that are close enough for executives to catch a convenient flight to their next conference. But for those cities not fortunate enough to be able to build a new airport city, and for those that are but wish to access an even greater catchment, fast and reliable access is now increasingly important. All modes of transport - road, rail, and even waterways, need to be optimised in order to keep these economic centres operating (Sharp, 2004).

Intermodal hubs are now becoming a common theme of the large airports throughout the world – particularly in Europe. The key function of an airport is *"to provide a physical linkage between the air vehicle and the surface vehicle"* (Ashford, Martin, & Moore, 1997, p. 7). Yet only in the last twenty years, has this concept been considered for the creation of true intermodal hubs. An intermodal hub should design an airport to provide convenient and seamless transfers between all services: air, road, and rail (Cokasova, 2003). Some of Europe's key airports are in fact positioned to be key HSR hubs similar to their downtown equivalents, attracting rail passengers to park at the airport. These passengers still use the terminal, but not once does their journey involve an aircraft. Currently, only 181 airports offer some sort of airport rail-link, and some of those still need to be connected by bus or shuttle services (IARO, 2012).

Importantly for this study, the addition of an airport station to the regional rail network can simply be an extension to the existing rail line. This is unlike HSR that requires new infrastructure for the entire length of track from airport to final destination. HSR requires new track in order to achieve their high speeds and is a prohibitively expensive option for many airports and government's (Campos & De Rus, 2009). If regional rail is found a successful strategy for airports, this can be employed far easer than HSR. With the assistance of an alliance, regional rail may also grow the patronage for the airline, rail company, and airport.

This study will focus on passenger intermodal services. Freight is a separate and very large subject that may also be worthy of further investigation, but will not be addressed here. Passengers may not be as profitable to airlines, airports or definitely rail, as opposed to freight, but the implications for the national and regional economy can be far higher in terms of business deals, knowledge industries and tourism.

Categories of Airport Rail-links

This study will use a specific type of rail access categorisation as set out in the table below. Like many industries, different literature and nations use different terms for generic rail systems. Table 1 refers to four generic types of rail access provided to airports worldwide.

Table 1: Categorisation of Airport Rail-links

Geographical Coverage (Givoni, 2005)	Stubbs & Jegede (1998)	IARO, et al. (1998)	Context of this study	Existing examples
City centre	Special line	HSR dedicated links	CBD-Centric	Kuala Lumpur
Urban area	Metro line	Metro links, Accidental links	Metro rail	Sydney
The airport region	Branch line	Regional links	Regional rail	Brisbane to Gold Coast
National	Main line	HSR	International (Europe), Interstate (Australia)	ICE HSR trains from many European airports

Source: Adapted from Givoni (2005)

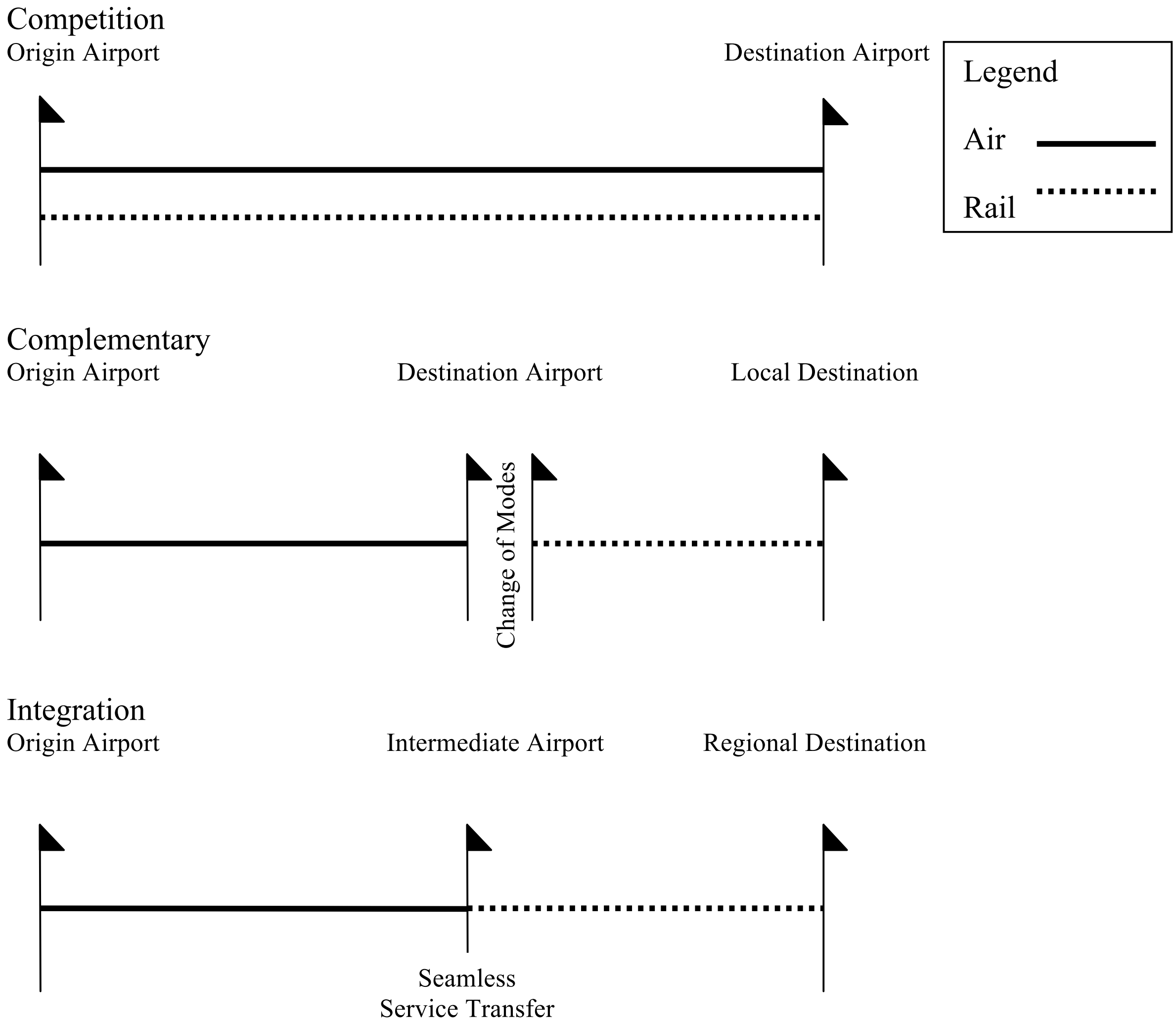
As illustrated, the categories begin with CBD-centric lines. The second category is the most common and utilises metro lines, providing access to the city centre and a limited number of urban suburbs (IARO, et al., 1998).

The third model is applicable to this study. It provides regional access directly from the airport. In the context of this study, 50km from the airport is considered to be regional access. Airport stations could be located down a branch line as is the case in Brisbane or a through line such as Sydney and could continue for hours in many directions. The last model is similar but serves stations beyond distances reasonably considered to be within the airport's passenger catchment area.

Models of Airline and Rail Interaction

There are three basic models of airline and rail interaction, as shown in Figure 2. While many researchers use different names for these the concepts are identical. The titles used here will be used throughout the remainder of the study.

Figure 2: Examples of Airline and Rail Interaction



Source: Cokasova (2006, p.12), Givoni (2005, p.45)

Competition. When airlines and rail companies compete directly with the same city pairs, they do so without necessarily considering the provision of intermodal connections. The two modes are direct substitutes for each other, but since they are operated by different companies, they will naturally compete (Givoni & Banister, 2006). Depending on a passenger's onwards travel, the level of competition changes. Those wishing to travel from downtown to downtown will find rail more convenient than air. However, those connecting from long-haul flights need ground transport options at the airport terminal to access their final destination (Cokasova, 2006). This competition is evident on many European routes, where for example Lufthansa has replaced short haul feeder services between Cologne and Frankfurt with HSR. Competition in this context is also often referred to as substitution and is a large focus of intermodal research to date (Cokasova, 2003, 2006)

Complementary. This is the most common interaction worldwide between airlines and rail, though neither is obligated to directly cooperate. Complementary services are where the airport is connected by rail to the CBD or beyond and the airlines simply serve this airport. Passengers in the complementary model choose to take a train to the airport then fly on an airline. Thus the benefits of complementary services are good for the airport, airline, and rail company, because passengers will choose the three companies over a less connected airport.

An example would be a passenger originating in the southern suburbs of Brisbane, who chooses to take the train to Brisbane airport and fly to Auckland over driving to Gold Coast airport to fly to Auckland – same start and end points. Costs aside, rail transport is a key differentiator between the selection of ground transport, airport, and possibly airline.

Integration. Building on the benefits of complementary services, integration essentially involves the airlines and rail company forming alliances and code sharing capabilities to encourage passengers to use their services. This is especially effective for long-haul flights and short-haul rail (less than 1hr). Levels of integration range from Swiss Airlines' offer of downtown check-in at Zurich Central Rail Station and the option of booking the rail ticket at the same time as your flight ticket to the fully integrated services between Lufthansa and Deutsche Bahn offering onwards connections from flights to any rail station in Germany, and baggage transfer and code sharing on some HSR services.

At present these models of air and rail interaction all refer to HSR as the speeds at which these trains travel mean they are comparable for duration, frequency, and comfort on routes less than one hour (Givoni, 2005). Most research has been centred on Europe (Cokasova, 2006; Eichinger & Knorr, 2004; Givoni, 2005; Kouwenhoven, 2008), where the development of HSR networks and overcrowded airports are increasing. This literature provides convincing case studies to demonstrate the effectiveness of HSR in Europe, and the advantage of high-density population to justify the expenditure in HSR between many city-pairs. However, not all airports have access to HSR networks and can be limited by topography and cost. A link to existing regional rail networks may be comparatively easy to achieve.

Current Integrated Regional Airline-Rail Alliance Models

There are three models of integrated airline rail alliances in common use. Primarily used throughout Europe, these alliance models are summarised in Table 2. The models relate equally to both HSR and regional rail. Dedicated service and entire network access are the two alliance models that are particularly relevant to this study.

Table 2: Summary of Airline-Rail Alliance Models

Model	**Description**
Dedicated service	Specific destinations, checked through luggage, dedicated train compartment providing airline service, code-share service.
Entire Network Access	All destinations, standard train service, checked through luggage sometimes available, airline business and first class passengers offered similar level of service on-board trains where available.
Re-protection Agreements	Emergency back-up service for airlines

Source: Deutsche Bahn (2012)

Dedicated rail services differentiate their service from other offers by providing passengers with the same level of service as expected on the alliance airline. Providing comfortable exclusive or reserved seating, complementary meals, drinks, power points, and served by train stewards (Bahn, 2012). These services are often code-share arrangements on specific trains to specific destinations.

The other alliance model of interest to this study is entire network access. This offers airline passengers access to all rail services that stop at the airport station. In this model a simple seat reservation may be provided at check-in or airline business and first class passengers offered a similar level of service on-board trains where available, checked luggage is not common but the access differentiates them from other non-alliance passengers (Bahn, 2012). The difference with this arrangement is that without separate dedicated carriages for airline passengers some of the 'exclusivity' of the airline specific service is removed. The advantage of this service is simple ticketing for onwards connections and the increase in airline catchment areas without needing to provide regional aircraft links.

The third alliance model is used as an airline re-protection agreement, commonly referred to as 'good for train' tickets (Bahn, 2012). In this alliance an airline ticket is valid on trains where there has been a service cancellation. This requires a rail line to be located at the airport in order to work effectively.

Summary

Rail's role in airport surface access is becoming increasingly important as airports grow and surrounding land is developed. Developing airports as intermodal hubs to serve connections between modes of surface access should further the growth of airports. The key to further growth is thinking beyond the CBD-centric rail-link, towards regional rail and integrated airline-rail alliances and encouraging passengers to use the alliance members for all phases of travel.

Outline of this Study

This introduction chapter provided the importance of the study to industry and literature, and the purpose for conducting this research. The chapter also developed the context and questions that will be the focus of the study. The background provided the context of the industry and introduced the complexities of the ability to study this industry.

The next chapter will review the literature relevant to the study. This will include strategic models that have been used to analyse results, and an outline of the current literature that exists. The literature review will also outline the weaknesses and gaps of current literature, which this study will aim to fill. The chapter will conclude with the benefits of this study and the development of the research question itself.

Chapter 3 will discuss the various methodologies that were considered for conducting this study; and will discuss in more depth the comparative case study methodology chosen. Data collection will be discussed, and the methods of analysing the data using the models outlined in the literature review will be discussed in more depth as an analytical tool.

Results from the case studies will be presented in an objective form in Chapter 4. These results will be the findings from the public open source and commercially sensitive literature from the cooperating companies, supported by interviews. An assessment, as far as practicable, is also conducted on various funding methods that have affected the case study situations in some way.

This study will then compare the case studies through strategic analysis to understand the cases in a more general sense. This discussion, in Chapter 5, will try and find answers to the ancillary questions and ultimately answer the prime research question of the study.

Chapter 6 concludes the study and highlights any unpredicted limitations or problems found whilst conducting the study. The conclusion will also put forward ideas for potential further research based on areas of weakness found in the literature during this study or areas where this study has potential to improve further.

Chapter 2: Literature Review

This chapter will outline the theories, models and literature that will be used later in the study. The industry will be studied in the context of strategic alliances. The theoretical models on strategy will be outlined, as they will be used to analyse this study's results. Current literature is available on similar air-rail topics to this study and will be discussed to highlight the weaknesses, gaps, and limitations.

As outlined in the introduction, this study will address the question of whether *"regional airline-rail alliances beneficial to airports as a competitive advantage*?" In order to achieve this three ancillary questions will be addressed. These are:

> What elements form competitive strategy in the industry?
>
> What are the differences between the strategies of successful airports and failures?
>
> Can rail infrastructure be constructed and operated without government financial support?

These questions will explore the industry as a whole before specifically analysing the impact of regional rail alliances. This literature review will follow the same format as the questions by outlining strategic models, successful air-rail interaction, then funding.

Almost every academic theory is based on the discoveries and ideas of its research predecessor. Paradigms are established as the result of a discovery, attracting academics away from other disciplines, and opening up a world of possible applications for further research (Kuhn, 1962). While this study is not attempting to create a new paradigm, the purpose of Kuhn's reference does challenge those who currently think within the standard paradigm and approaches to business. The well-used and common approaches are not necessarily the only way to achieve strategic outcomes. There appears to be a common view that the role of an airport rail-link is only to provide a mass transit connection between the airport and CBD. While there is a high correlation between modal share and CBD originating passengers (Bradley, 2005), this study suggests businesses should challenge traditional paradigms if they are to achieve significant competitive advantage.

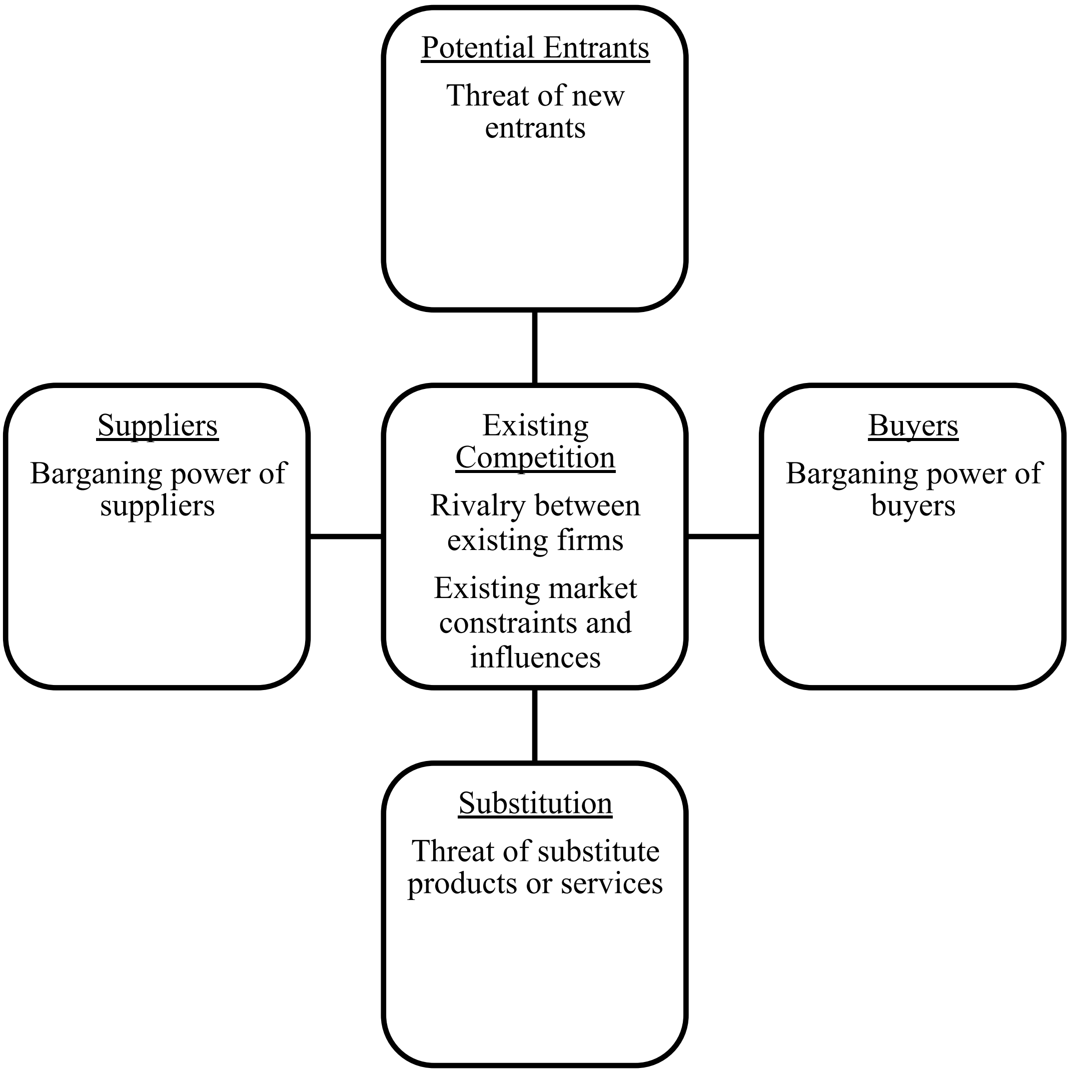
Competitive Strategies

The predominant authority of the classical approach to strategy is Michael Porter (Mintzberg, 2007; Whittington, 1993). He defines the essence of formulating competitive strategy as *"relating a company to its environment"* (Porter, 1980, p. 3). In the classical approach, the level of competition is neither luck nor coincidence; the market affects all companies identically and it is entirely the result of a company's strategy that determines success or failure.

There are several methods of understanding a strategy. To understand a single company and the external influences acting upon it, the value chain is a useful tool to view a company's processes (Porter, 1998). The value chain separates specific activities such as inbound logistics, marketing, operations, and outbound logistics. This allows individual components to be analysed in isolation to find competitive advantage. In the context of this study, the value chain will be considered from the airport's point of view. This is, from the supply of transport modes, through the operations of the airport, to the passenger using the service. While the value chain model explains the process from supplier to buyer for a single company, all companies are affected by industry competition.

Competing companies face the same five forces driving competition, which are depicted by Porter's (1979) now standard model. Shown in Figure 3, are the five forces driving industry competition are briefly described as follows:

Figure 3: Five Forces Driving Industry Competition



Source: Porter (1979, p.6)

Suppliers. Suppliers are a key focus of this study as these are the airport access modes competing with each other. Suppliers have a significant power within industry competition. This can be seen at hub airports, where airlines control the allocation of runway slots and can stifle new airlines expanding into these airports (Barrett, 2000; Dempsey, 2001).

Buyers. Opposite the suppliers are the buyers – the customers of the service provided. In the context of this industry, these are the passengers. The people who can choose the most convenient or cost effective service to travel via and are powerful in seeking lower costs and can easily choose different suppliers, new entrants, or substitution (Pearce & Robinson, 2009).

Substitutes. Substitutes are the threat of complete replacement of an industry. Replacing travel altogether with teleconferencing or replacing airports with direct city-to-city HSR. When the threat of substitutes is low, the ability to raise prices increases (Pearce & Robinson, 2009).

Potential Entrants. The threat of new entrants to the market that offer new platforms for suppliers and buyers to bargain with (Pearce & Robinson, 2009). Secondary airports and green-field developments could be considered in this context. These may not be a current consideration for an airport, but an apparently sudden development can become a significant threat. Developed secondary airports attracting low cost carriers could be an example of this in this industry.

Existing Competition. The previous four forces are all however a constant consideration of existing industry competition. All jostling for market share, each existing member of the industry adjust and try and make better use of the four forces to their advantage (Porter, 1979). In particular, the relationship between suppliers and buyers and existing competition of a single airport is a focus of this study. This is the value chain that will be referred to throughout the remainder of this study.

Maximising efficiencies and the attractiveness of this value chain should entice more passengers (buyers) to the regional modal choice (suppliers) through a specific airport (existing competition). The above competitive analysis can be used to formulate an appropriate strategy for businesses operating in that industry. Using another of Porters (1980) models, there are three generic models of planning future success: through differentiation, overall cost leadership, and focus as shown in Figure 4. A company needs to plan to achieve at least one of the factors or find themselves in somewhat of a limbo. As the competition revolves around them, they could be left at the entire mercy of the marketplace.

Figure 4: Three Generic Strategies

Overall Cost Leadership	Differentiation
Focus	

Source: Porter (1980, p.39)

Overall Cost Leadership is a common strategy as recently seen with the prevalence of low cost carrier airlines. This strategy requires a tight control over internal costs. It works well with large companies who have significant bargaining power to manipulate their external expenses from suppliers, and pass on these low costs to buyers. In this study, this cost to passengers is key to the definition of cost leadership. One commonly used method of reducing costs in industry is the use of strategic alliances. This can reduce the operating costs of many varied services through the reduction of empty seats or expanding the market without the need to invest in new staff and services in underused locations. The risks however, are when competitors follow suit; the value of the dollar or inflation can erode the small profit margin. The lack of ability to change with technological developments due to a reduced capacity for capital investment can also reduce profits (Porter, 1980).

The value of time will also be considered to be part of overall cost leadership. The concept of VOT will be discussed in more depth later, but essentially this is the perceived cost to the traveller. For example, a passenger can be more relaxed or productive on a train than if they were driving themselves in a car. The apparent cost will be lower, even if the true ticket price was actually higher.

Differentiation is the other industry wide generic strategy. It is a common strategy in technology and vehicles. For example, a Mercedes performs the same core function as a Hyundai Getz, travelling from A to B with some passengers and luggage. To the consumer though, the two vehicles are completely different products. The quality finish, brand image, and customer service distinguish Mercedes as a more superior and more exclusive product. This is turn creates brand loyalty and a resulting price sensitivity, and thus a barrier to potential entrants. The negative effect of differentiation is it can significantly reduce market share because of the lack of cost leadership in most cases (Porter, 1980). The risk to differentiation is largely due to low-cost competitors becoming too attractive to maintain customer loyalty. Externally this was evident during the financial crisis when many business travellers switched from first and premium airline seats to low cost carriers, the cost savings outweighed the exclusivity of élite travel.

Focus is the third generic strategy. The strategic target of this approach is for a particular segment of buyers only. Focus involves a company's trade-off between profitability and sales volumes (Porter, 1980). Their clientele focus is so tight that their market share is understandably low, but they market to a particular segment only and succeed in doing so. In the context of this study if an airport rail-link were focused on a single destination, or a single line, not offering an integrated direct service to the rest of the network, then they would be deemed to have a focus strategy. A focus strategy can call upon the approaches of cost leadership, differentiation, or both, a focus offerings being limited to a portion of the market. The risk to a focused strategy is the narrow orientation of the company's investment, which can erode when industry wide offerings by other competitors equal the company's service or product. Furthermore, the success of the company's focus could attract others into the same small market for which the customer base is limited.

How each company reacts to these five forces determines the differentiation between success and failure. This is why it is essential that companies do thorough analysis of this structure to fully understand the situation and to identify a unique advantage before planning a strategy (Porter, 1979). In the context of this study, the forces effecting one airline, airport, or rail company are no different from their competition. Once each of the five components is understood, the strongest forces will become apparent and these need to be the focus of the differentiated strategy of the organisation. Lufthansa faces the same forces as Swiss airlines, the same buyers, suppliers, substitution from rail and road; they need to understand this and somehow take advantage of a difference they have over the other company. This difference between companies then feeds into the next phase of competitive analysis. After the current environment is understood through analysing each of the five forces, a strategy is then formulated to approach the market.

Within each of these generic competitive strategies there are many different methods of creating further competitive advantage in the industry. But as will be discussed throughout this study, the above generic strategic options are an easy method of establishing a high level understanding of a company's planned strategy.

Alliances

The aim of an alliance is to share fixed costs, assets, skills, and knowledge which a company could not necessarily develop on their own (Hill & Jones, 2009). With this sharing, the goal of the alliance should be to better the current position within the three generic strategies as outlined above. There are many different types of alliances ranging from high level strategic alliances to more convenience based commercial alliances. The key difference between the two ends of the alliance spectrum is the level of joint vision and asset sharing between companies.

Commercial alliances are less involved; sharing of some services, specific routes, and pro-rate agreements can all fall under this group, whereas *"strategic alliances co-mingle assets to pursue a single set of objectives"* (Doganis, 2006, p. 79). These strategic alliances can include joint ventures, generally striving for tangible benefits and due to the legal nature, requiring deliberate planning. These alliance companies should complement each other in some part of the value chain. This can be done through vertical or horizontal integration.

Vertical integration is the outsourcing of some component of the value chain (Hill & Jones, 2009). This can be either forward or backward from the core business. An airline could consider its core function to be operations and service delivery. The outsourcing of heavy maintenance activities would be a backward integration in their value chain, and may be beneficial when this task is too expensive to conduct in house.

Horizontal integration is the integration of other companies that conduct the same part of a value chain. This allows a company to increase market share and focus management and resources on competing in one industry (Hill & Jones, 2009). This would be exemplified in this study by airlines buying forming alliances with other airlines, Air New Zealand and Virgin Australia for example.

In recent decades, strategic alliances have become increasingly common and seen as an essential method of securing stability and control in a competitive industry environment (Casson & Mol, 2005; Doganis, 2006). A benefit commonly sought from these strategic alliances is accessing special products or services that one company does not process the skills to produce. Alternatively, an alliance can allow a company access to a market through a 'local' agent, which could be too costly or difficult to obtain for a new start-up or achieving economies of scale through outsourcing some phase of the value chain (Contractor & Lorange, 2004). In other words, partnering with a company that is better at one of the strategic models of differentiation, cost leadership, or focus should improve a company's strategic position.

Because the methods of applying competitive strategies are specific to every industry, this study will narrow its scope to the transport industry. Normally alliances in the transport industry are designed to enable an apparent growth of a network, offering passengers a seamless journey to many more destinations than available through any single airline or rail company. For the alliance member it is a method of reducing costs through integrating value chains and sharing services, otherwise incurred by servicing less profitable routes. Thus alliances allow passenger transport companies to expand more rapidly due to the restructuring of routes. Market dominance, often through a cost leadership strategy, therefore allows passengers to access more destinations than their competitors (Doganis, 2006). Combining crew training, maintenance, administration, and handling improves the cost for all alliance companies reducing expenses. It also enables a higher fare to be charged for the convenience of check through services (L. Zou, Oum, & Yu, 2011).

Rigas Doganis is a prominent researcher in aviation strategy. While his research is focused on the aviation industry, the concepts he discusses are relevant to rail and the orientation of this study. As Figure 5 shows, there is a continuum of alliance types ranging from simple sharing of minor services through to full mergers. At one end are commercial alliances, where a different company conducts one function of the value chain, such as baggage handling. At the other end of the continuum is a strategic alliance. This includes joint ventures, where airlines have a combined goal offering a common brand image and uniform service. This is exemplified by large airlines franchising their image to smaller airlines. The franchisee flies in the larger company's colours and use the same ground handling, ticketing and check-in services.

Figure 5: Continuum of Alliance Models

Type of Agreement	***Vertical integration / Type of Alliance***
Interline/prorate	**Commercial Alliance**
Mutual Ground Handling / Baggage services	↑
Frequent Flyer Programmes	
Code-Share	
Block Space	
Common sales/ticketing outlets	
Schedule/Capacity Co-ordination	
Joint Engineering	
Joint Flights	
Franchising	
Common Branding	
Joint Cargo and Passenger Services Ventures	↓
Full Merger	**Strategic Alliance**

Source: Doganis (2006, p.82)

Even commercial alliances reduce the capital costs of extending networks. Companies can remain independent and do not need to expand their core business beyond their prime role (Doganis, 2006; Sauter-Servaes & Nash, 2009). There are risks though of medium and small airlines entering into alliances as the large companies could deploy their own aircraft on shared routes once they become more profitable (Doganis, 2006). However, those airlines with smaller regional services still have a place in the airline environment. Providing the feeder services to the alliance hub, their growth and development is less of their own making, but at the mercy of the larger company. This is equally the case with rail alliances that use trains as a feeder to airline hubs, rather than regional airlines.

This study will draw alliance models from across the full spectrum of those discussed above. Understanding how different alliance models operate in the transport industry should assist further in understanding the relationship between airlines and regional rail companies. It will also aid in understanding how these relationships can benefit an airport.

Now that the general context of strategic alliances in this study is understood, the current research and theories of transport alliances will now be discussed. This will assist in understanding the factors that influence the supplier and buyer forces of Porters (1979) industry competition. While this section may appear to be more focused on the practical application of the benefits to passengers, it is essential to highlight the current theories and research which form part of the current paradigms of transport alliances.

Intermodal Alliances

As mentioned previously, there are real benefits to forming airline alliances (Doganis, 2006). If a company understands buyers (their passengers), reduces rivalry amongst firms, wards off potential threats, and increases bargaining power with suppliers, the company should be competitive (Porter, 1980). The problem is all the other competitive airlines are applying the same strategy. Most are trying to compete by being a cost leader (Doganis, 2006). This approach has become a paradigm of aviation strategy. However, it is starting to be challenged through extending airline alliances to other transport modes and forming intermodal alliances. This has the effect of increasing the strategic competitive advantage of the original airline alliance.

Porter refers to the threat of substitution. However, substitution can be a benefit to an airport, airline, and rail company. So long as passenger numbers and revenue do not decrease, a regional airline that is substituted with some other transport mode may benefit all of the horizontally integrated alliance members. Cost benefit in the more strategic intermodal alliances is achieved through the ability of airlines to substitute short-haul routes with trains and redirect those aircraft to more profitable long-haul routes (Givoni, 2005). In the more commercial alliances, intermodal alliances are simply a marketing strategy. This is particularly so for airports where the airport rail-link is simply a connection with the CBD, offering only a small differentiation between alliance and non-alliance passengers.

Specifically for airline-rail alliances, Moshe Givoni has become on of the most acknowledged academics on the specialised subject, since the publishing of his 2005 Doctoral thesis. His original thesis studied the benefits of integrated airline-HSR alliance, substituting aircraft on short-haul routes with HSR had benefits on increasing the catchment area of an airport and showed better value of time (VOT) could be achieved with HSR

(Givoni, 2005). While this study is not specifically researching HSR, Givoni's thesis does provide an excellent basis to compare regional rail with other transport modes using similar methods. This includes his understanding of the roles, influences, and benefits to alliance members and the success of the airport rail-link.

Capacity and Role of the Rail Company

Beckers and von Hirschhausen (2009) discuss the value chain of passenger rail networks. One significant difference between aviation and rail is the rail company often has less flexibility and control over their track access. Open access is not yet as common worldwide as open skies has become for the aviation sector (Beckers & von Hirschhausen, 2009). Thus, the ability to change schedules is not as easy for the rail company especially during peak periods, where regional services share rail lines with metro services. Though this is similar to airlines operating from large hub airports where they need to compete for runway slots.

However, an often-overlooked fact of railway lines is the significant amount of latent capacity they have compared to roads and therefore the lower infrastructure investment costs over the long-term. A single passenger train can remove 525 cars from the road (Deloitte, 2011). Once a road reaches capacity the only solution is to add extra lanes. Rail has an ability to increase its capacity by increasing frequency, provided signalling, timetabling, and possibly train lengthening can occur (Deloitte, 2011). Therefore, the long-term cost of investment in rail-links may often be less than roads. This is particularly the case where the rail-link is provided on an existing rail line, or as a branch to it (European Commission, 1998a). This also has benefits to the environment around the infrastructure, as extra lines are not usually needed once an initial two lines are built, whereas roads require more land to expand and therefore upset the public. To an intermodal alliance, this capacity can be used for airlines value chain improvement.

Rail has a significant role to play in airport operations, whether or not they are part of an intermodal alliance. Albers, Koch, and Ruff (2005) also analysed the value chain of airports and airlines. Significantly, rail directly influences two of the twelve activities they researched, and at least five of the activities indirectly. This is the interaction between the alliance and passenger which is so important to the alliances success (Weber & Sparks, 2004). The number of services, frequency, and quality of rail service has a direct impact on the benefits of the airport-airline-rail alliance (Cokasova, 2006). These are all factors that an intermodal alliance should be able to coordinate and achieve a better passenger experience.

Role of and Benefits to Airports

When considering the steps involved in a passenger's journey from home to destination, an entire system of transport modes can be used. Throughout this study one central point of passenger travel will always be considered – the airport. This is also the context of the industry competition that Porters (1979) model will be viewed from. The interest and investment in airport rail-links is increasing and proving successful at many large airports (Eichinger & Knorr, 2004). The airport is the modal interchange and both airlines and the rail company heavily rely on this central function as a part of their value chains. Airports are a nucleus attracting passengers through ground transport from their catchment area. In the literature, an often-neglected user of these services is the commuters who work near the airport.

As much as one third of surface access is caused by these commuters at large airports, not just those who work in the airport grounds such as, retail, ground handlers and airline staff, but also those in the surrounding business parks, hospitality and factories (European Commission, 1998a). While these commuters are unlikely to need the full intermodal services, they are repeat customers on rail services and a major beneficiary from the airport. These customers should be considered when building suitable links to airports should consider the customers.

Two of the most influencing elements of airport quality of the passenger experience are transfer reliability and punctuality, even if the airport does not have any direct control over these factors. Poor punctuality and reliability not only impacts the image of the airline from a passengers service experience, but the actual operations of the airport itself (Albers, et al., 2005; Cokasova, 2006). Airports should work with airlines to enable smooth and efficient transfers between flights (Albers, et al., 2005). While Albers, et al., focus on hub airport alliances, these important elements identified are applicable to any passenger transport experience, including rail.

The airport plays a critical role in an airline-rail alliance. First, it supplies a key piece of infrastructure for the interaction between modes, secondly as the beneficiary of rail services, it is a key stakeholder for intermodal development (Givoni, 2005). While the first is reasonably well researched, the second role is the focus of research in this study.

For airports, the benefits of code-sharing alliances have been found to have positive effects. By replacing low passenger loaded aircraft with higher loads, airports served by these routes enjoy a more stable schedule and are more efficient. This is because they process more passengers at once, using the same infrastructure income (Huber, 2009). Additionally, this allows airlines to develop competitive strategies elsewhere in the network by creating new routes to hubs and new point-to-point routes.

Similarly, previous studies have focused on the airport gaining from rail-links to reduce or remove flights to particular destinations, and thus at crowded airports freeing up runway capacity for expansion to new long-haul destinations (Givoni, 2005). This increases the number of passengers using the airport terminal, thus increasing the non-aeronautical revenue from terminal activities such as retail.

It should also be noted, that the cost of parking at major airports is also a large revenue source and by providing rail-links they may not be able to generate the same profit from tickets. Auckland airport for example generates as much as 8% or NZ$33 million of their revenue from car parking alone (Auckland Airport, 2011), and could therefore be a significant disincentive to funding a rail-link. The European Commission's Cost 318 report (1998a) found that non-aviation revenues from passengers decreased with the addition of a rail-link. The reliability of trains allowed them to arrive closer to their departure time than if driving by car, which has more variables effecting the journey time.

Because of this concern over non-aeronautical revenue, the focus of airports is expanding beyond the terminal and apron activities. There is an increase in commercial development of the land surrounding airports, which airport companies are now focusing their revenue streams towards (Kasarda, 2000). This development will not only increase revenue, it should also increase commuter passengers in the rail line.

With the increase in liberation of the aviation industry worldwide, there is an increasing competition between airports (European Commission, 1998a). In order to attract more services to medium and regional airports in particular, a key focus has been on improving services to equal or exceed the levels provided at their competition. As these secondary airports are serviced less frequently by airlines, punctuality and lack of congestion are key attractions for both passengers and airlines alike – particularly for low cost carriers (de Neufville, 2005; European Commission, 1998a). Secondary airports also have a lack of frequent feeder services to their airports from the regions compared to their major competitions. The commission suggested airport rail stations on through-lines operating regional services could provide an increase in regional passengers without any additional feeder flights (European Commission, 1998a).

Role of and Benefits to Airlines

The role of airlines in intermodal alliances is largely centred on the passenger experience. The passenger experience was previously highlighted in the airport section by Cokasova (2006) and the European Commission's Cost 318 report (1998a). Furthermore, the Cost 318 report highlights that liability is an important consideration for airline-rail alliances. In the event of a delayed train, passengers also felt it was easier to justify to airline staff as they were unlikely to be the only ones affected (European Commission, 1998a). Rail travel is not covered by IATA regulations, where airlines are. Airlines involved should provide the alliance guidance on how delays may affect the passenger and what assurances these companies can provide.

The benefits to an airline in being part of an intermodal alliance is that airlines in airline-rail alliances can substitute short-haul services with trains and therefore free up those aircraft for the more profitable medium and long haul services (Givoni, 2005). Additionally, the airline benefits when these services increase the catchment areas for the major hubs and thus reduces the need to fly aircraft to smaller regional airfields to capture that population. The catchment area is better effected by HSR services because time is more of a concern to passengers than distance (Givoni & Banister, 2011), however all rail should increase the catchment area to some extent.

Catchment Area

Direct services from throughout the airport catchment are critical to achieving high modal share over other modes (Kouwenhoven, 2008). This not only involves CBD-centric trains, but also continuing services to the remainder of the airport catchment area. The addition of an airport rail-link will actually increase the catchment area of an airport provided there is reasonable regional access. The formation and use of an intermodal alliance by passengers should further increase the catchment population by encouraging passengers to the seamless journey. This occurs once the airport is successful in changing significant volumes of passengers to change their normal travel patterns, this will then cause a redistribution of air traffic (European Commission, 1998a).

Many studies in the past have focused on competition between air and HSR and defined competitive distances. Janic (2003) defines HSR routes up to 400km as dominant over air and up to 1200km as competitive, others use maximum distances of as little as 600, 800, and 1000km (European Commission, 1998a). Moshe Givoni studied these findings and as a key research question in his thesis. From his results, he further defines the benefits of HSR as:

> *On HSR routes of under 800km in length, where the HSR route is not more than 20% longer than the aircraft route, and the average HSR speed along the route is at least 200kph, the operation of airline and railway integration is beneficial to airlines, passengers, and society.*
>
> *(Givoni, 2005, p. 242)*

The issue with all of these definitions of catchment area is that rail lines do not always travel in a direct line, as topography and urban development areas limit their ideal alignments. Additionally, there is no set definition on the speed of HSR nor is the operational speed directly related to the travel times from point to point. However, the assumption made for use in this study was that rail could be competitive with airlines on routes less than four hours long.

As has been highlighted above, there are some areas that have been well researched in relation to the influences and benefits of intermodal alliances to rail companies, airports, and airlines. This previous research is either exclusive to a specific mode, such as airlines, or broad in the sense it applies to all modes. There is no study that relates specifically to regional rail in the context of this study. However, the results of previous research will be used as the basis of analysis. The subjects discussed so far are general in tone. This literature review will now narrow to the specific elements of airport rail-links that have been found to create success and will later form the specific elements of data collection.

Successful Factors of Airport Rail-links

As mentioned previously, the value chain of this study is the matching of suppliers of regional access modes to the passenger. In order to understand these modes of access in the context of Porters (1979) forces of industry competition, the supplier force will be analysed from success factors of airport rail-links. These factors are found in research literature and will be discussed in two parts, the passenger experience and funding.

Passenger Experience

Research conducted in separate studies found the most important reasons for success of airport rail-links. The factors relevant to this study are frequency and reliability, price, journey time, seamless travel, and multi-modal information and ticketing (Brons, Givoni, & Rietveld, 2009; Cokasova, 2003, 2006; Eichinger & Knorr, 2004). Additionally, Givoni (2005) found the VOT had a significant effect than journey time and price on passenger modal choice. These elements will be used extensively throughout the rest of this study to collect and analyse data for understanding the supplier force of competition in Porters (1979) model.

Frequency and Reliability. These are common elements of any successful transport system, but more so in airport rail-links (Cokasova, 2006). Passengers travelling to flights feel they may miss their flight if the trains are not reliable, they also want added frequency to avoid dwelling at the terminal. Considerers a passengers journey from leaving home to the aircraft gate. If trains are not frequent enough, passengers may have wait for long periods at rail stations. Passengers in this situation are more likely to take a car or taxi to the airport, thus rail loses its advantage (Eichinger & Knorr, 2004).

However, airport commuters are less reliant on journey time and frequency than passengers (Eichinger & Knorr, 2004). For commuters to use the service timetabling is more important. Trains need to run well past the last aircraft arrival and continue until the end of workers shift. Thus a near twenty-four hour service at major airports is essential, even if it is at a significantly reduced rate overnight (Eichinger & Knorr, 2004).

Price. A series of case studies in Europe found that price sensitivity is less of a factor for air travellers over regular commuters (Kouwenhoven, 2008) and business passengers are more likely to pay premiums for faster direct services (Cokasova, 2006). Provided total journey time and customer satisfaction remained superior, rail can actually charge a premium, while still retaining a significant modal share. For example Oslo airport's express train charges an extra 30% fare over buses and taxis yet still achieves 33% modal share (Kouwenhoven, 2008). However, Oslo's case could be due to the fact that it is located some 50km from downtown. From this, one can see that journey time may have more of an effect than the ticket price.

Journey Time. One must consider the passengers journey as a door-to-door time as this is the most significant factor in passengers modal choice (Cokasova, 2006; Kouwenhoven, 2008). Thus while the speed of trains and aircraft are large parts of this consideration, the effect of changing modes, connecting services, and access to rail terminals need to be considered. As Givoni and Banister (2011) point out, it is not necessarily the actual speed of the train which makes for faster travel times, but the overall journey. Reducing the number of intermediate stops, which account for up to five minutes a time, will significantly improve the competitiveness of rail compared to road transport. In essence, if the train journey is faster than the existing road access, then it will have a competitive advantage. To analyse this function in the context of this study, journey time will be given a price. This price is known as VOT.

The Value of Time. VOT is a method used to determine the perceived value of transport modes. It is calculated by assigning a monetary value to work, leisure, and intermediary activities (Givoni, 2005). Intermediary activities are those events which are essential to achieving either work or leisure, but unproductive to either, such as commuting. This VOT can be viewed as an overall measure of value and can be further broken into in-vehicle time and out-of-vehicle time.

A positive correlation can be found for passengers taking rail transport over other transport modes because they could convert part of this intermediary time to work or leisure. This could be in the form of reading a book, or working on the laptop. Whereas travelling in a car, it is much more difficult to do these activities and the likelihood of the traveller being the driver is also very high (Mokhtarian & Salomon, 2001). So long as the time and cost are similar, there are opportunities for rail over other access modes.

Considering both in and out of vehicle time in the context of an intermodal transfer, different transport modes have different values placed on different modes of the same journey. For example the flight and the train trips of the same journey (Furuichi & Koppelman, 1994). An assumption used in Givoni's (2005) thesis is that from a passenger's point of view the journey begins again at the moment of arrival at the interchange terminal. For example a passenger arriving at the airport terminal after a flight considers the airlines role to be complete, and the train journey has begun. This is where the waiting (or rushing) begins and any issues with way-finding or other inconveniences will affect the passengers' opinion of the train journey, not the flight.

Givoni also used a single VOT figure for all nations studied, simply correcting the exchange rates to allow comparison. However, different nations have significantly different prices of VOT, depending on various factors such as environmental impacts, perceived safety, personal income, GDP, and other socio-economic influences (Bristow & Nellthorp, 2000). It could be that the prominence of public transport in each nation will have an effect on the values passengers place on their transport preference. For example an American resident could be more likely to prefer driving a car because they are more used to this form of transport and value the ease of going where they want when they want (Sperling & Gordon, 2008). Conversely, a German, who has rail access and has more likely experienced good public transport, may prefer public transport to driving a car.

While VOT estimation is good for making reasonable comparison in monetary terms for cost-benefit studies and the like, there may be an almost complete unwillingness from passengers to pay for the benefits of this time-savings. In a study of Athens International Airport, of 486 passengers surveyed 42% would not pay any amount for a 25% (15min) time saving and of those remaining respondents who would pay, 63% would not pay more than €1.00 (Tsamboulas & Nikoleris, 2008). There are some issues surrounding the survey that have skewed the results to such a negative outcome. In particular, asking passengers who are waiting at the airport, not those who are running late. Late passengers may have wished they had taken a different mode of transport. Notably for this study however, Tsamboulas and Nikoleris (2008) found a significant difference in the willingness to pay for service improvements between regional and metro passengers. This may be due to the more tiring nature of the longer distance travel.

Seamless Travel. In Europe there is a growing push for short-haul flights to be replaced with HSR (European Commission, 1998a). However, poor transfer experience, particularly while waiting at the airport will increase the out of vehicle VOT. Consider long-haul airline passengers connecting through to rail services, particularly regional services. They need the same level of service, comfort, and wayfinding while transferring between aircraft and train as they would expect for any code-share arrangement between air carriers (Eichinger & Knorr, 2004; IATA, 2003). If this experience is poor, then this transfer may have a significant weighting on the overall journey.

The location and configuration of the rail station in relation to the terminal building determines the inconvenience to the passenger (Givoni, 2005). The distance between the gate and platform will assist in increasing passenger satisfaction and determine the best location for the platform (IARO, et al., 1998). This can be determined as the ease in which to navigate between transport modes with wayfinding, travelators, and without needing to leave the terminal building. Rail platforms can be located either underneath or beside the existing terminal for the same passenger satisfaction. It has been found that the attractiveness of intermodal transfers is hampered by any requirement for an intermediate connection to reach the terminal, such as people movers or shuttles (Eichinger & Knorr, 2004).

The location of alliance partners' gates near to each other in the terminal is a significant indicator of passenger satisfaction with airline alliances. (Weber, 2005), therefore, careful consideration of locating the rail terminal near gates to allow short walks and centralised lounge access should be of importance. If airline alliance's with rail change, moving aircraft gates and airline lounges is far easier than if one were to consider changing passenger access to a rail platform.

Surprisingly, no studies related directly to the impact of distance between train platforms and gates have been found. Considering the cost of building this infrastructure, this is a valuable future research study. The effect of the location of stairs and check-in services was found to have a significant effect on bottle-necks and increasing distance between the two modes would increase transfer time (Cokasova, 2006). However, evidence from passenger satisfaction or VOT is required. Cokasova also found the effect of station access is far less important to business travellers, who are only 26% likely to use rail to access the airport versus leisure travellers at 62%, possibly as a result of business travellers preferring taxis which are paid for by their employer (Cokasova, 2006).

An increasing number of airports are creating a more seamless travel experience by allowing remote check-in at downtown stations (Sharp, 2004). This increases passenger satisfaction as the passenger no-longer need to carry their luggage between their ground access mode and airport check-in counters, and it can reduce the dwell times and queues at the airport (Cokasova, 2006). Passengers simply change from train to plane as they would for any other full-service connecting flight and is proving very successful at airports such as Frankfurt, Kuala Lumpur and Hong Kong (Sharp, 2004).

Multimodal Information and Ticketing. The ability for passengers to be able to compare the benefits of price, timetable and duration of airlines and rail together has been a known issue for some time (European Commission, 2004a; Sauter-Servaes & Nash, 2009). Integrated ticketing is a fundamental requirement for passenger satisfaction (Cokasova, 2003). The inconvenience of booking two separate tickets for different modes is likely to cause passengers to look for an easier option, particularly business travellers who don’t pay for transport (Cokasova, 2003). Therefore, if alliances are to truly attract passengers through convenience then the first step should be the booking process.

The Rail Air Intermodality Facilitation Forum noted multi-modal ticketing in particular was an essential requirement to enable airline-rail transfers, and thus alliances, to be more successful (RAIFF, 2004). To help enable multi-modal transfers, particularly for baggage, IATA has allocated codes to rail stations and countries, for example the code *QYG* is now used as the collective ‘airport code’ by German rail services.

It is clear from the existing literature that for an airport rail-link to succeed, all of these factors of frequency and reliability, price, journey time, VOT, seamless travel, and multi-modal information and ticketing should meet or succeed the other ground transport options. But limitations still remain. While these studies show the requirements for a successful rail-link, few provide evidence on the impact of airline-rail code-sharing. The effect of regional rail versus HSR also lacks empirical evidence.

This literature does however provide a solid base of knowledge to understand the context of this study’s research problem and begins to show the practical components that need further research to answer the first of the two sub questions on the competitive elements and strategies. While the six success factors outlined above may increase passenger satisfaction and increase patronage, for an airport rail-link to be successful it needs to be adequately funded.

Funding Transport Infrastructure

Ultimately, is an essential factor operationally to allow rail to be a successful supplier force to airport industry competition. Funding is also one of the most critical elements in the building of an infrastructure project. Companies, passengers, and the government may desire an airport rail-link, but without the money to build it, the idea will never progress to reality. The cost of public transport infrastructure is usually too expensive to recover costs through ticket sales alone (Salon & Shewmake, 2011), particularly railways. Other financing methods are required.

Government involvement in transport infrastructure can be considered necessary as it can bear significant amounts of risk and costs which may cause private sector companies to shy away (Hull, 2008). This can occur in many different forms, including land value capture, public private partnerships, government subsidies and grants. Internationally, there have been many different methods of investing in transport infrastructure. Three of these will be reviewed as general concepts in this literature review, as the generic funding models will be discussed later in this study.

Land Value Capture. Land value capture (LVC) is a form of recouping investment from developing land. When politically allowed, this has been used successfully on various transit projects worldwide (Roakes, 1996). The value of land increases with the installation of transit infrastructure (Hess & Almeida, 2007) and makes land value capture an attractive form of public financing. LVC can occur in various forms, from simple capital gains tax to more complex models. An example of a non-capital gains tax model is where the government or private companies purchase large parcels of land, develops this with attractive infrastructure such as transit services, and then sells the parcels of land for a higher price. The value added is captured and returned to the infrastructure cost (Batt, 2001).

Public Private Partnerships. A second form of political investment is the public private partnerships (PPP). Traditionally transport projects have been financed, designed, built and operated by the government (Koppenjan, 2008). PPP can be beneficial if the project is well defined and researched. The use of PPP is becoming more common on large infrastructure projects, especially in Australia, with several motorway and rail lines under PPP arrangements (P. Zou, Wang, & Fang, 2008).

Subsidies and Grants. It is rare for the operating costs of a transport system to be fully covered without the addition of government subsidies, let alone investment in infrastructure (Salon & Shewmake, 2011). Even roads are not fully covered by road user charges, fuel tax, and tolls. The level of funding received through these methods has a large reliance on the government's position of rail as a public good (Zahariadis, 1996). Subsidies and grants are common throughout the world for rail, including Europe and Australia.

Alliance Benefits to Passengers

The benefits of airline alliances have been relatively well researched from the viewpoint of the airline company (L. Zou, et al., 2011), more recently the benefits of global airline alliances have been studied from the viewpoint of the passenger (Goh & Uncles, 2003). Interestingly, airlines promote numerous benefits of alliances to passengers such as greater network access, seamless travel, transferable priority status, lounge access, and enhanced frequent flyer program benefits. However, the passenger may not rely on these benefits over basic non-alliance features such as perceived safety, reliability, and service attitude (Doganis, 2006; Goh & Uncles, 2003). Out of 20 factors effecting business passengers to select a particular airline, the first alliance controlled factor is placed sixth, with seamless travel. Network coverage, lounge access, and airline being part of the preferred alliance were placed 14, 15, and 18 respectively. Goh and Uncles' findings are significant for this study as they are based on data collected from Australian business travellers – thus the importance an alliance may have in encouraging airline-rail use through alliance could be influenced by the very same factors.

Interesting also, is that since these studies were conducted, the development of online booking engines such as Expedia and Travelocity have flourished. These tourism e-mediaries are able to take the competitive advantage over existing airline alliances. Passengers can now compare journeys in terms of convenient departure times, total duration, number of stopovers, and all importantly the fare; factors alliances cannot effectively control (Dale, 2003). This reduces the need for passengers to use alliances as their multi-leg ticketing agent.

However, there are still areas where an alliance benefits a passenger. A key element of airline alliances is the expectation of similar quality on any airline throughout the group, a poor quality service on a code-share airline can effect customer satisfaction of the preferred airline (Driver, 1999). The more significant interaction between airline staff and passengers occurs at the interchange between services or modes (Cokasova, 2006). Logically therefore, passengers have more interaction at check-in, boarding and non-personal experiences such as way-finding, than they do with the handful of stewards on-board the flight (Weber & Sparks, 2004). Weber and Sparks' (2004) findings were that over half of passengers considered the alliance to be responsible for ensuring all airlines met the standards required. This study will therefore use these findings of interaction points with the alliance members as a key element of what could set a successful alliance apart from the unsuccessful. This is particularly relevant to this study, as it will always involve the airport as part of the value chain.

An advantage of these airline-rail alliances to passengers is the better guarantee they have when delayed flights or trains would normally cause the passenger to book a new ticket, just as an airline alliance would bear the cost of this disruption. This has however been identified as a significant barrier to airline-rail alliances being introduced, and there is currently a lack of legislation requiring the two modes to supply this guarantee (RAIFF, 2004). This perhaps is due to different paradigms the two modes operate under, and as airline-rail alliances become more prevalent, this should change.

As outlined, the current research suggests the traditional benefits to passengers of alliances are decreasing due to the increase in online booking engines. However, there are still significant areas where alliances could still improve the passenger experience at points where passengers interact with the alliance, either in person or non-human elements such as wayfinding. This study will take these lessons learnt from the airline and industry and other intermodal studies to form a foundation of key experiences necessary for regional airline-rail alliance strategy.

Summary

As demonstrated by this literature review, substantial research has already been completed on strategy and intermodal alliances. However, there is a particular gap in this literature in that non-HSR regional rail has not been studied in depth. Nor has regional rail been studied in relation to strategy benefits in an alliance with airlines. Breaking the paradigm of current CBD-centric airport rail-links could be a successful strategy to increase modal share, and will be assessed in this study.

The basis of strategic models for successful competition within the industry is well researched, in particular by Michael Porter. His (1979) model of the five forces driving industry competition provides academics with a solid understanding of how strategy is best analyses. In the context of this study the value chain that links suppliers with buyers through an airport is of particular interest. Porter developed his theory of understanding the current industry to being able to project strategy forward and strive for success. He does so by outlining the three generic strategies that companies should position themselves in, to succeed against competitors (Porter 1980).

The forming of alliances may aid in developing these strategies, by using specialised services or local markets. The aim of which is to improve the value chain. Alliances have proven to be worthwhile in the aviation industry (Doganis, 2006; Sauter-Servaes & Nash, 2009; L. Zou, et al., 2011). The concepts have much in common with all forms of transport. If successful, alliances benefit passengers (Goh & Uncles, 2003).

In the formation of an intermodal alliance, rail companies (European Commission, 1998a; Givoni, 2005), airports (Albers, et al., 2005), and airlines (Givoni, 2005) all have a role to play in improving the value chain and competing in the competitive industry. This cooperation should see an increase and further increase all members' patronage and competitive position within Porter's five forces of industry competition.

The key benefits buyers should find in suppliers, which in this study are the modes of transport, are well understood as successful factors in airport rail-links (Cokasova, 2006; Kouwenhoven, 2008). These six elements being frequency (Eichinger & Knorr, 2004), price (Cokasova, 2006; Kouwenhoven, 2008), journey time (Givoni & Banister, 2011), VOT (Givoni, 2005), seamless travel (Cokasova, 2006), and multimodal ticketing (European Commission, 2004a; Sauter-Servaes & Nash, 2009).

As successful as these factors may be, the rail line may not be able to cover operating and capital investment costs by fare box revenue alone (Salon & Shewmake, 2011). Various methods of investment are available, including LVC (Tang, et al., 2004), PPP (Koppenjan, 2008) and subsidies (Salon & Shewmake, 2011). To achieve the best passenger experience, all six of the success factors and funding should work together. By doing so, rail should increase in modal share (Cokasova, 2006).

Table 3: Fields Relevant to this Study and the Prime Academic Research

Field		**Author**
Strategy	Theory	(Mintzberg, 2007; Porter, 1980; Whittington, 1993)
	Competition	(Porter, 1980)
Alliances		(Albers, et al., 2005; Doganis, 2006; Goh & Uncles, 2003; Huber, 2009; Uncles, Dowling, & Hammond, 2003; Weber, 2005; Weber & Sparks, 2004; L. Zou, et al., 2011)
Air-Rail	Competition & interaction	(Cokasova, 2006; European Commission, 1998a, 2004a; Givoni, 2005; Givoni & Banister, 2006; Janic, 2003)
	Intermodal Access	(Cokasova, 2006; European Commission, 1998a; Kouwenhoven, 2008; Mandle, Mansel, & Coogan, 2000; Sauter-Servaes & Nash, 2009; Sharp, 2004)
	Rail Use	(Beckers & von Hirschhausen, 2009; Brons, et al., 2009)
	VOT	(Givoni, 2005; Tsamboulas & Nikoleris, 2008)
	Funding	(Hess & Almeida, 2007; Koppenjan, 2008; Salon & Shewmake, 2011; P. Zou, et al., 2008).

Source: Author

The general benefits and weaknesses of the individual elements of strategy, alliances, airport-rail interaction, success factors of intermodal transfers, and funding are understood. This study will draw from all of these elements to better understand this industry, but also in the more specific context of regional rail in airline alliance. This context should also provide a better understanding of the competitive advantages to airports and satisfy the current gap in literature.

Chapter 3: Research Design

The aim of this study is to identify the advantages of airline-rail alliances beyond the city centre and their benefits to airports as a competitive advantage. Therefore the following research question is formulated:

Are regional airline-rail alliances beneficial to airports as a competitive advantage?

The structure of how this study will address this research question was aided with three ancillary questions. This aided the study to understand various components of strategy in the industry as a whole, before analysing the strategic advantage of regional rail.

Firstly, *"What elements form competitive strategy in the industry?"* will ascertain the strategy used in each of the case studies. Porter's (1979) five forces of industry competition were used as a structure to analyse these elements. Direct benefits such as cost to passengers, travel time advantages, seamless travel, and importantly regional network access of the alliance and other companies was researched. This provided key reasons why a passenger would choose one mode of transport over another, and hence what should be driving strategic planning.

The second ancillary question was, *"What are the differences between the strategies of successful airports and failures?"* To answer this question, this study used case studies to find any common strategies between the successful cases and any strategies that are deficient in the unsuccessful cases. This should show if regional services and or alliances correlate to the success of an airport's competitive strategy. Porter's (1980) model of three generic strategies including cost leadership, differentiation, and focus was used to compare the case studies.

To be successful in substituting other suppliers to the industry, rail should be financially stable. Therefore the final question was "*Can rail infrastructure be constructed and operated without government financial support?"* Due to the need to limit the scope of and keep this study within a masters level research timeline, indirect benefits such as socio-economic and environmental impacts, were not researched. However, the source of financing was studied as these can affect the freedom a company enjoys to develop their own strategy.

From these questions, the research question will be able to be addressed. These ancillary questions will allow regional rail to be compared to the rest of the industry to find if there are any strategic advantages.

Research Method

The choice of research method was not an easy decision in this study. A positivistic paradigm was initially considered, as it would have allowed for a more factual, qualitative study, with the ability to validate and generalise results (Collis & Hussey, 2009). Possibly due to the paradigm's more step-by-step nature it could have provided an easier method of preparation too. However, for the limited duration of this study it was decided the ability to research under this paradigm would likely take too long. With such a narrow field of applicable samples in which to survey and analyse, and the lack of quantitative data available from the case studies, this paradigm was abandoned. Additionally, the ability to isolate external influences, which are often cited in literature on this subject, would be too difficult to generalise these quantitative findings.

Because of external influences, such as politics, economics, geography, and culture, the decision was made to use the interpretive paradigm. This allowed results to be understood in the context of each specific situation, in their normal environment (Collis & Hussey, 2009). Provided willing participants were available, this would yield more fruitful results across a broader range of issues than the interpretive paradigm.

For each case, the research question is essentially ‘why is this situation working (or not)?’ Therefore, understanding the situation and context was required in the natural environment, focusing on contemporary events. These elements suited the exploratory case study methodology over any other method (Yin, 2009), and was therefore chosen to be the method used in this study. Elements of other methodologies may appear, such as quantitative comparisons of some figures to another, but they were interpreted only in the context of their specific case.

More specifically, a comparative case study method was used to increase the ability to validate results and generalise the findings. Case studies can be just as valid and reliable as quantitative research methods (Yin, 2009). Unlike quantitative experiments that limit and control external influence, cases studies can offer explanations on why something occurs that was outside of the anticipated research. In this study, validity was improved by using multiple sources of evidence. Additionally, the multiple cases allowed for pattern matching and replication logic.

The sample cases were selected to gain an understanding of the variance between the very successful and the failing airport rail-links; and to understand what sets them apart. Additionally, geographically dispersed cases were sought to understand the affect that geography, culture, political, and other factors could have as an external influence on success. Though these factors were not investigated to any great depth, they did provide boundaries to limit the generalisation of results and highlight areas for further research. From these selection criteria, and after some unsuccessful responses from potential participants, four cases were selected. Arguably the best intermodal model in the world – Frankfurt; a city and airport of similar size to those found in Australia, and yet still successful – Zurich; and two often quoted failures – Sydney and Brisbane.

Data Collection

Ideally, the results presented in this study are as empirical as possible to allow more objective comparison and generalisation. However, this was not easy. The majority of the airline industry and parts of the rail industry are becoming increasingly open access and privately owned. This has meant the competition between companies has also increased. Therefore, obtaining operational data was difficult. While publicly listed companies are required to publish some performance data for their shareholders, the data is usually broad in detail, and was often lacking specific information to use in empirical research.

Data was primarily collected from each of the case study locations through document analysis of company annual reports, studies conducted by the organisations themselves, and previous academic literature to provide a solid high-level understanding of each airport rail-link operation. These sources were preferred over interactive methods to avoid bias from these companies that, understandably, believe their service to be the best. Language differences caused minor confusion with the interpretation of documents at times, and could have an unintended bias.

Clarification was required to deal with this bias, to seek amplification of the reports, and to understand the information at a level at which comparison and motivation could be understood. This clarification was conducted using email questionnaires and interviews with specialist managers in the alliance airlines, airports, and rail companies. Details on operations were also assisted by analysis timetable and ticket price data available from the official company websites.

In order to analyse the different airport access modes later in the discussion, data was collected on the passenger experience. Here the criterion for successful airport rail-links, as outlined in the literature review, was used to guide the data collection. Some supplementary elements were also added to provide the study with more contexts. All of these following aspects were reported on for each mode of access available to the airport:

- Funding
- Competition airports
- Alliance models
- Catchment and modal share
- Frequency and reliability
- Journey time
- Price
- Value of Time
- Seamless travel
- Multi-modal information and ticketing

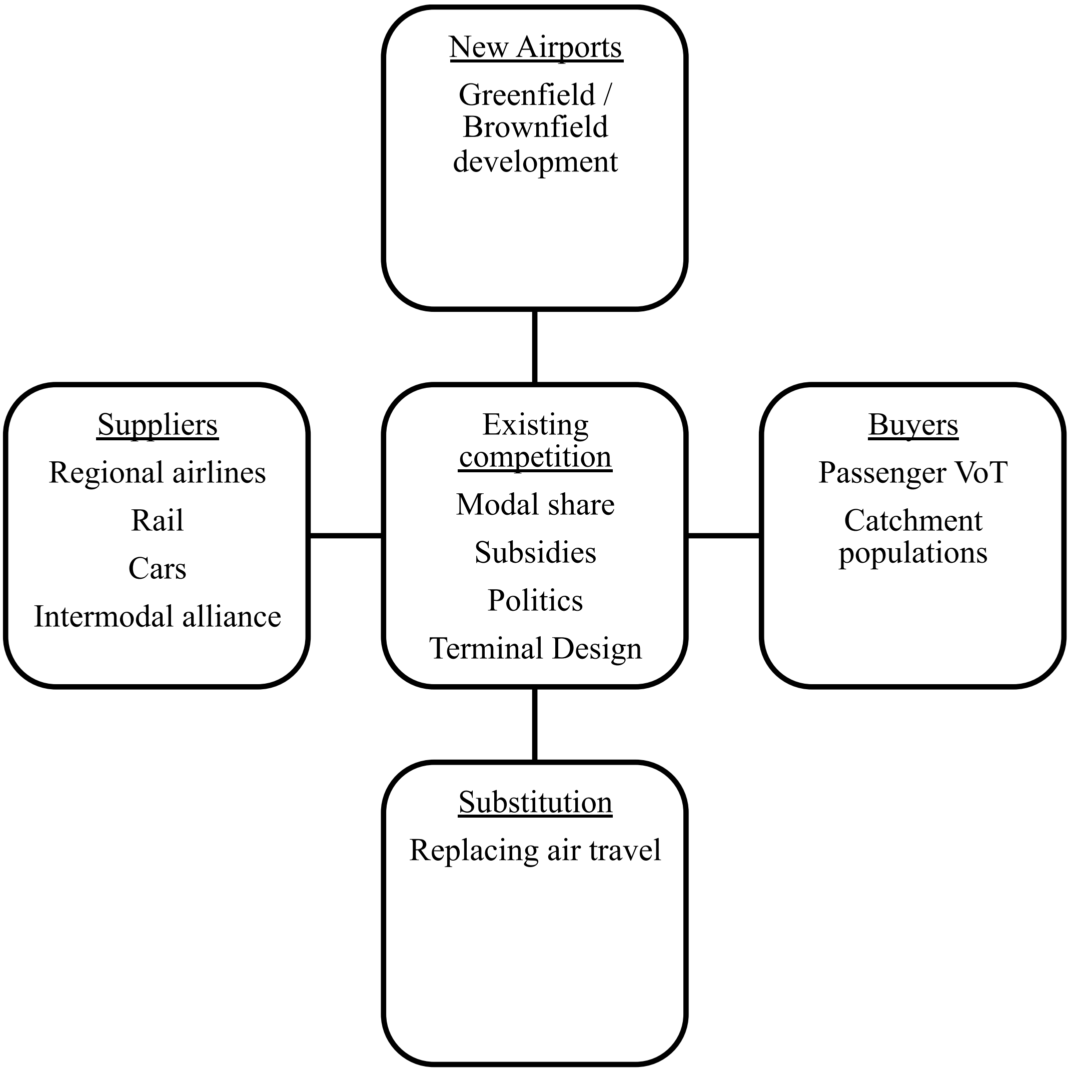
More specifically, cost and total journey time was calculated using published regional routes plotted against distance to understand the pricing strategy of rail compared to car modes. VOT was calculated with local values to each case study and also plotted against distance. This provided the study with an opportunity to compare ticket price and VOT as influencing factors.

For these graphs of price, journey time, and VOT, the modes of transport that will be compared will be regional rail versus private car. Initially buses were to be compared, but after some initial research it was found that where trains operate services from airports or city centres public busses do not. In fact the data from Frankfurt reflects this with less than 1% of modal share being busses (Flughafen Frankfurt, 2012). Similarly, rental cars were going to be compared, but the cost was always well above the cost of rail and private cars due to the daily rental charge, so this too was removed. As a result, only car travel and trains are compared.

Data Analysis

To ensure consistent analysis across all four case studies, the common models outlined in the literature review continue to be referenced throughout this study. In particular each case was be assessed against Porter's (1979) model of five forces of industry competition. Each element of this model was investigated in the context of each case, to understand what affects the success (or failure) of their competitive strategy. This was done from the point of view of the airport. Figure 6 depicts the various companies that form the forces of industry competition and will be discussed in this study. Infrastructure funding has an effect on all of these factors but is primarily discussed in the existing market conditions.

Figure 6: Five Factors Affecting Modal Share at Airports



Source: Adaption of Porter (1979) for the context of this study

A key component of any competitive business strategy is to increase profitability or market share with any new venture (Porter, 1980; Whittington, 1993). For simplicity in this study it was assumed that these are one and the same (although it is acknowledged that market share does not always result in profitability). Therefore, a key finding required to conclude any competitive advantage from the alliance, is that the alliance companies achieve market share somehow. Porter's (1980) model of three generic strategies was used to compare strategies to find out which strategies work over those that do not. In this context:

Cost leadership in the context of this study includes perceived cost. Therefore, value of time was used in addition to real monetary costs. As quite rightly pointed out by Givoni & Banister (2011), the total duration time of the train journey from station-to-station is the most important factor. As such, total duration of services is used to compare rail with other access modes.

Differentiation compares the benefits to the passenger and the alliance members over other modes of access. An understanding of products and services available or exclusive to the alliance is explored to understand how these alliances position themselves to achieve the market share over the individual modes.

Focus explores the extent of direct and connecting access to the rail network from the airport. A car obviously has access to any place they wish to travel, but cumbersome and time consuming changes of train are likely to be detrimental to the modal share of rail over car.

Once each type of service offered in each case study is plotted against the three generic strategies, any similarities are discussed. The research will find any similarities between the successful case studies and similarly between the unsuccessful. This will provide the data to answer the research question.

From this, recommendations on strategies that could be employed have been put forward. Funding and political support has also been discussed briefly as this is likely to be a large influence on strategy implementation.

Ethics

Procedures set forth by the Massey University Human Ethics Committee revealed this research to be of low risk. A low risk notification was made to the Committee and all participants were advised of this.

Summary

In summary, this study has made use of the comparative case study method to compare four cases, two successful and two failing examples. Each case was assessed in the context of Porters (1979) five forces of competition to understand where the case sits in its environment. From this these results have then been taken and assessed as to where they fit into the generic competitive strategies. The research question has then been answered and recommendations on political influences to aid strategy implementation have also been found.

Chapter 4: Results

This section will provide the specific details of each of the cases that will be analysed and compared later in this study to find competitive strategies. Four case studies have been chosen from the many airport-rail-links worldwide to learn from the successful and the unsuccessful, in order to find common themes of best practice strategies. The elements of successful airport rail-links outlined in the dedicated section of the literature review will form the format of data resented in each of the case studies. Specific data and graphs of journey time, price, and VOT for each of the 15 rail lines analysed are presented in Appendix A.

There are many existing airport rail-links and airline-rail alliances worldwide. Europe is the prime continent for this interaction. Despite there being many airport rail-links outside the continent, airline-rail alliances are limited to just a few locations. Of those, few have been operating continuously for as long as European examples. The two cases, Frankfurt and Zurich have been chosen as successful working models of airport rail-links. Conversely, Sydney and Brisbane have been chosen as they reflect the poor results found in Australasia thus far.

A key element of finding the different strategy positioning is to understand the VOT of different rail lines. In each of the case studies, multiple rail lines were used to compare all of the elements of successful airport-rail-links. VOT graphs were calculated for each rail line and are shown in Appendix A. Because of this importance of VOT to the results, one must understand the VOT figures that have been used for each case.

Value of Time

The VOT for transport mode selection in Germany was last comprehensively studied in 1998 and found a value of between ECU/hr 3.90 – 21.40[2] (European Commission, 1998b), but Switzerland had more recent data as at 2004 CHF/hr 9.70 – 32.50 (Axhausen, König, Abay, Bates, & Bieriaire, 2004). As Frankfurt and Zurich are geographically close, it has been assumed that the VOT for both nations will be similar. Additionally, as Switzerland and Germany are both German speakers, residents may be influenced by similar media messages.

To confirm this assumption, Switzerland's second language is French and a more recent study has found the VOT of France and Germany being nearly equal when making complaints about travel service (London Economics, 2009). While this is measuring a different variable of public transport, it is a reflection of the attitudes toward modal choice. Therefore the recent study by Axhausen et al. (2004) will be used for both European case studies.

In Australia the most recent data is for 2006. The Australian figures vary between A$8.80 – A$10.10 (Australian Transport Council, 2006; VTPI, 2012) for the different transport modes of rail and car. Other data was available (Austroads, 2004), but used different methods of comparison and it was decided to use the same data throughout the study to avoid further complicating the results and reducing validity of the data.

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[2] The EC study used European Currency Units as the report was prior to the introduction of the Euro currency.

The Australian data above did not differentiate between business and leisure travellers. However, it has been found that business travellers have a VOT of 150% of wages and leisure travellers is 35% (VTPI, 2012). Therefore these percentages were used to calculate business VOT. The resulting data is shown in Table 4.

Table 4: Value of Time for Case Studies by Mode

Country	**Mode**	**Value of Time**
Germany & Switzerland	Train (Business)	30.30 CHF/hr
	Train (leisure)	9.70 CHF/hr
	Car (Business)	32.50 CHF/hr
	Car (Leisure)	12.30 CHF/hr
Australia	Train (Business)	37.71 A$/hr
	Train (leisure)	8.80 A$/hr
	Car (Business)	43.29 A$/hr
	Car (Leisure)	10.10 A$/hr

Source: Axhausen, et al. (2004), Australian Transport Council (2006), VTPI (2012)

The VOT data will only be used to compare results of each case study in isolation. Therefore there is no need to convert figures to a single currency or adjust for inflation. The aim of using this VOT data is to find any significant differences between car travel as a driver, car travel as a passenger, and train travel. This should assist in determining the strategy of each case study in competing with the other modes. Comparing data between different case studies will not be done on the same chart.

Europe

At the very top of European transport coordination is the European Commission (EC). The EC Energy and Transport Division provide guidance on where improvements need to be made to the passenger experience and the development of services. The organisation also funds a large part of key European infrastructure.

At the research and guidance level, the EC produces many reports outlining the best methods of improving the passenger experience and therefore increasing public transport and intermodal use. Commonality of physical infrastructure, wayfinding, common ticketing, baggage handling, and promotion of intermodality are key issues which the EC has begun developing common standards for use throughout the European Union (EU).

From a funding point of view, the Trans-European Transport Networks (TEN-T) is the Community financing tool. Their aim is to achieve goals of economic and social cohesion while contributing to sustainable development (European Commission, 2004b). The TEN-T prioritises key intermodal infrastructure and funds significant portions of their capital. All EU nations pay into the fund, which then acts as an independent body to prioritise the projects throughout the entire region, currently all rail projects are HSR networks.

Begun in 1967, the Hamburger Verkehverbund was formed as a public authority coordinating the services of seven public transport firms, three states, and 140 cities and towns (Pucher & Kurth, 1995). The Verkehverbund has proven to be a successful cooperative model, and is now used in many cities worldwide, significantly for this study in Frankfurt and Zurich. Their role was revolutionary at the time – to provide coordinated public transport services with minimal service transfers, using an integrated ticketing system and simplified fare structure (Pucher & Kurth, 1995).

Four components ensuring the success of the Verkehverbund model are common to this study. Firstly, coordinated services allowed the authority to reallocate assets and expand service frequency and routes. Secondly, service quality improved as a result of this coordination, minimising wait times, and the required number of transfers between services. Thirdly, simple fare structures and one ticket for all services made it easier for passengers to understand the system. And finally, the combination of marketing assets and funds allowed a broader marketing campaign against other modes of transport rather than between the individual companies (Pucher & Kurth, 1995). These are all themes that will become evident in the examination of the Frankfurt and Zurich case studies to follow.

The two European case studies have similarities in their political framework and coordinative transport structures. Therefore, it is considered appropriate to have discussed them together before highlighting their individual differences as follows.

Frankfurt Airport

Located only 15 minutes from the CBD and located on a main arterial rail line and the intersection of two major freeways, Frankfurt airport is an ideal position to market itself as an intermodal hub for both passengers and freight. For rail specifically, the large network access allows for 397 trains per day in addition to the CBD, region, and internationally. The first trains began to stop at Frankfurt Airport in 1972, by 1999 the demand had grown significantly and with the introduction of HSR throughout Europe a second station dedicated to HSR opened.

Funding. The rail infrastructure is owned and operated by the national rail company Deutsche Bahn. It is the opinion of the airport that Deutsche Bahn is charged with the responsibility of building new lines and increasing service frequencies based on public need and financial feasibility. It is also the view of both companies that airlines do not have a role in the investment in building or operating these airport rail services, just as rail has no place in the development of airlines.

Government funding covers most construction and capital costs and operating subsidies for the services can also be expected. Accurate figures are scarce and the level of direct and indirect subsidies confuses the situation. However, there appears to be agreement that subsidies during 2011 alone for regional rail routes is €2.5 billion per annum directly to Deutsche Bahn, and a further €7 billion per annum to the States throughout Germany, solely for investing in regional rail (The Economist, 2011). These subsidies are for the entire rail network, so only a proportion effects Frankfurt airport. However, it does show the considerable commitment the German Government has to the rail networks.

Competition Airports. On a large scale, Frankfurt competes with London-Heathrow, Paris de Gaulle, and Amsterdam-Schiphol for passenger traffic into Europe and as an intercontinental airline hub. All of these are accessible by train from Frankfurt, though arguably, the train to London from Frankfurt is beyond the time sensitivity of most travellers. More locally, Frankfurt competes with Cologne and Stuttgart. Both of these have dedicated HSR trains operating every hour and two hours respectively in an alliance with Lufthansa and Deutsche Bahn.

Alliance Models. At Frankfurt Airport, all three of the airline-rail alliance types are available to the public including re-protection, dedicated services and entire network access. Re-protection arrangements, as defined in the literature review, are available for those airlines wishing to use Deutsche Bahn for this service. This model is currently in use by Lufthansa and Air Berlin. The use of the 'good for train' tickets was used extensively by Lufthansa and Berlin Air during the Eyjafjallajökull eruption in 2010, where extra trains were provided to transport the airlines' stranded passengers throughout Europe (Deutsche Bahn, 2010). However, the two alliance models of more interest to this study are *AIRail* and *Rail&Fly*.

AIRail is a code-share alliance that to the passenger appears no different than a normal airline code-share arrangement. The alliance was trial and error for the two companies until 2007, when the Cologne to Frankfurt air service was ceased by Lufthansa and all flights operated on the HSR network. The alliance now also operates on the Stuttgart – Frankfurt route by rail only. The airline can now offer passengers hourly services to Cologne, and two hourly services to Stuttgart, while still providing the same comforts and service to that expected on an aircraft.

Rail&Fly is an entire network access alliance. It is used by some 80 airlines at Frankfurt airport, of which Lufthansa is one. This service is a commercial alliance that is marketing orientated. The service encourages passengers to book rail tickets at the same time as their airline ticket to any rail station in Germany. This is a successful model for the Airport, which did experience an increase in passenger numbers associated with the introduction of the service, most likely due to an increase in catchment area. For Lufthansa, as the prime airline of the airport, they can use this service to extend their catchment also and further publicise and build on their rail alliance.

Catchment. Frankfurt Airport's view as to why their rail services are so popular is that within one hour of travel time (200km by HSR) their catchment area contains 38 million people and 70% of Germany's GDP. This population and the airports considerable rail network access is considered to be the reason they can attract the 397 average daily train services, and 34% of all passengers by ground access mode (Bahn, 2012). This is considered high even for the more rail centric European population and is largely due to the HSR network.

The HSR line between Frankfurt Airport and Cologne opened in 1999. While actual figures were not available to the public due to commercial sensitivity, the airport found a definite increase in passengers using the service and deduced it was a result of reduced travel time increasing the airport's catchment area. With the introduction of Rail&Fly a similar increase passenger numbers occurred, but due solely to convenience and marketing as the catchment area did not change. Frankfurt simply became a more attractive option for passengers.

In Frankfurt non-HSR regional trains account for 2% of modal share. This is disproportionately low because HSR accounts for 19% but has higher service levels. The remaining 12% accounts for the CBD only passengers. In total, 33% of passengers access the airport via rail.

The airport is discussing with Deutsche Bahn an increase the HSR network and frequency of services through the airport in the future this should continue to expand the catchment area of the airport. This should increase the catchment population of the airport from the regions. The intermodal access, particularly rail, will continue to be a key marketing campaign to attract airlines to the airport.

Frankfurt Airport uses the Deutsche Bahn service, including AIRail and Rail&Fly as a significant part of their marketing to attract other airlines to the airport, particularly the five train services which have IATA codes for airline booking and code-sharing (Flughafen Frankfurt, 2012). These IATA coded trains allow airlines to purchase bulk tickets and on sale to passengers at a lower price, or sometimes free. This clearly benefits the airport and rail company for increasing numbers, but also the airlines in increasing sales through this marketing campaign.

Frequency and Reliability. With nearly 400 services per day at the airport and all connecting through bigger central railway stations, the frequency is ideal for almost any passenger travelling to or from the airport. Additionally, the intermodal reliability of rail services allows Frankfurt the ability to guarantee 45 minutes to transfer passengers from train to plane (Picardi, 2003).

Journey Time. Results of three routes from Frankfurt to Leipzig, Augsburg, and Dortmund can be found in Appendix A. Comparisons between the three routes show little to no difference between the journey times of rail to cars.

Price. The cost perceived by the passenger for rail is slightly higher than the apparent cost of driving the same route in a car, but well below the true cost of car operating costs. Rail&Fly, being set at a flat €29, became more beneficial to other train passengers at 100km and over the apparent costs of car travel at 150km.

VOT. Because journey times are so similar, so too is the VOT of rail and travelling by car as a passenger. Self-drive car travel was marginally less attractive at around €10 more costly beyond 250km. This close link between journey time, price, and VOT appears to be the basis of Deutsche Bahn's pricing strategy and competition with cars.

Seamless Travel. The airport has two rail stations, one for local and regional (conventional) trains, and another for long-haul HSR. Both are through stations on the national network and the main arterial for the Rhein-Main region. However, the location of the stations is not ideal. Despite the airport having good surface access, its weaknesses lie in airport design and layout. Automated people movers and shuttle busses connect the three terminals, but rail services stop only outside terminal 1 (KITE, 2008). The airport has overcome this issue with forty airlines now offering check-in desks at the rail station so passengers no longer need to carry their luggage from the station. Additionally, Lufthansa has check-in desks at key rail stations throughout Germany, particularly for AIRail services, luggage is checked through to the passenger's final destination – just as passengers would expect from full service airlines between connecting flights.

Multimodal Information and Ticketing. Information is available on the websites of Deutsche Bahn, the airport, and Lufthansa about intermodal travel and the alliance services. At the rail station, the presence of check-in desks and airlines is obvious. The airport does offer rail and airline service desks to independently purchase tickets and request information for those not traveling on an alliance service. As outlined above the AIRail ticketing is seamless and unless one checks the aircraft type, there is no difference between the ticketing of the airline or train tickets.

Zurich Airport

For one of Europe's richest cities and with a corresponding high ratio of car ownership, the city has been very successful in encouraging citizens to use public transport. Many other cities that use congestion taxes to raise the price to vehicle drivers and encourage a move toward public transport fail to recognise that trams and busses often must use the same road network, and thus the time savings is minimal. However, Zurich has made public transport an absolute priority with dedicated lanes and automatic traffic light switching for approaching transit vehicles (FitzRoy & Smith, 1993). This priority of public transport has created a high ratio of public transport users at 37.5% of commuters (Federal Statistical Office, 2010).

Zurich airport is located only nine kilometres from central Zurich and processes 24.3 mppa (Flughafen Zürich, 2011b). The airport operates as a private company and is listed on the Swiss stock exchange. Flughafen Zürich AG receives no federal funding for the operation of the airport.

Airport passengers can access rail services to the Zurich CBD in as little as nine minutes. The airport also has tram services operating to surrounding suburbs and continuing to the city centre. Long distance train and bus services are offered across Switzerland and to neighbouring nations directly from the airport rail station.

The Zurich airport rail-link is clearly more than a simple airport-CBD mass transport. It is a well integrated part of Switzerland's national rail infrastructure, offering direct connections to 78 stations and hundreds more with transfers at key railway stations (Flughafen Zürich, 2011a). The line has also been in operation for a long time.

The airport station is located on a through line between Zurich to Winterthur. Though originally opened in 1980 as a new loop off the main line, it now services the majority of passenger services. Rail companies operating to the airport includes many international companies such as TGV, OBB, Deutsche Bahn, and CityNightLine. The national rail company, SBB, conducts the majority of the rail services to the airport. The national rail company provides train services throughout Switzerland, internationally to Germany, France, Austria, and Italy.

Funding. Like all main-line railways in Switzerland, the infrastructure is owned and maintained by SBB (SBB, 2011b). The SBB is funded through shares held by the Swiss Government and local Cantons. As such the SBB is heavily subsidised. During the 2011 financial year, the company received CHF2.95 billion in grants, loans, and operational subsidies. From the Federal Government, excluding loans, CHF1.95 was given to the company and CHF348 million was received from the Swiss Cantons to operate their regional services (SBB, 2011b). After these subsidies, in 2011, the company was still at a slight loss of CHF5 million. All infrastructure is subsidised through grants and loans.

Competition airports. Zurich Airport's prime competitors for the Swiss market are Basel (90 minutes away) and Geneva (three hours away). Airtrain has enabled Swiss Airlines the ability to develop Zurich as an intercontinental hub and increase the catchment area towards Basel. Basel has remained a much smaller airport for the airline. Geneva though is much further away and is also a hub for the airline.

Alliance Models. Alliance offers from Zürich Airport include Night&Flight, dedicated services, and baggage handling services. Night&Flight services are provided by CityNightLine, which has in the past offered alliances with Swiss Airline for return fares. While this alliance model has much merit and could be explored in more depth, the service is very long-haul and will not be explored further in this study. However, dedicated services and baggage handling services are of particular interest.

Airtrain is a dedicated code-share alliance between SBB and Swiss airlines, a wholly owned airline of Lufthansa. The service offered is direct non-stop from Zurich Airport to Basel seventeen times daily. It is operated on-board a normal direct rail service between the two points. First and business class airline passengers are offered first class train travel, and economy offered second class. The differentiation being Swiss Airline customers are offered the service free of charge when booked with in conjunction with Swiss Airline flights.

Baggage handling services are offered in both directions. Fly-rail operates from the airport and check-in at rail station operates to the airport. Fly-rail baggage provides convenience, but not integrated ticketing. Started in 1980 with the opening of the rail station, this is an alliance offering by SBB and is facilitated by Zurich and Geneva airports. During check-in at any airport worldwide, the Fly-rail service allows a passenger to check baggage all the way through to their final rail station within Switzerland. Swiss Airline first and business class passengers are offered a discounted rate.

Check-in at rail station is similar, but is for passengers departing Switzerland. Baggage can be checked in at over 50 rail stations, but only for Swiss Airline, Lufthansa and some charter flights (Swiss, 2012). The service started in 1989 after the success of the fly-rail service. For this study, both fly-rail baggage and check-in at rail station will be considered as the same alliance model (baggage services).

Catchment. Within two hours drive of Zurich Airport 12 million people reside, much less than Frankfurt. Interestingly, Zurich has a very local catchment area, as beyond one hour travel only 10% of staff and 19% of passengers originate (Flughafen Zürich, 2011b).

An interesting constraint placed on the airport's building consent is that the airport must achieve a 42% modal share of public transport. The airport has been exceeding this with 46.3% last recorded in 2009 (Flughafen Zürich, 2010). By 2011 the airport had exceeded this target considerably by achieving 89% public transport modal share, of which 66.5% were by rail (Flughafen Zürich, 2012). This is by far the highest modal share of all airport rail-links found during this study worldwide.

The airport brochures focus on their catchment area being 'two hours by car' and could initially be seen to be encouraging other modes over rail. The push to grow the airports catchment boundaries is not evident in the literature or interviews; rather it is a convenience for the airport and Swiss Airlines. However, the fact that the airport has such a large rail share over other modes and an extensive network of long distance trains, as well as dedicated CBD connections shows the focus of the airport is dependent on rail.

Frequency and Reliability. The airport serves as a stop for 384 trains per day, 238 of which are long-distance of regional services (Flughafen Zürich, 2011b). The frequency of connections to the Zurich CBD is at least every ten minutes, which connect to further onwards rail connections. SBB measures reliability between on time to three minutes late. With this, 89.8% of trains were on time and 97.7% of connections were made during 2011(SBB, 2011a).

Journey Time. On the relatively straight journey between Zurich and Geneva, the journey time for rail and car is very similar. However, due to the Swiss Alps, the rail network is disadvantaged over road access on the other two routes studied. Car drivers have many more options to take alternative routes through the mountains and around lakes. This can be seen in the graphs where there are significant changes to the line in these graphs, Appendix A.

Price. Again, due to the terrain issues, the cost of the journey correlates to journey time. The cost of the Airtrain is free for Swiss Airline travellers and therefore a very attractive option for this journey.

VOT. This suffered significantly on two routes due to the increased time. Similar to the Frankfurt case, the VOT of the train was very similar to car travel on the straight route to Geneva.

Seamless Travel. The train station is located directly beneath the main terminal building, offering a completely indoor experience. Above the platforms are check-in desks and services for both trains and airlines, and a large range of shopping and eating options to entice waiting passengers and increase the airport's revenue. Access from the airline gate through to the platform is comfortably within a ten minute walk. Plenty of waiting areas are available. The ground transport options, including rail, bus, and tram rated over 80% in the annual ASQ airport service quality awards in 2011 (Flughafen Zürich, 2011a). This illustrates that the terminal satisfies most passengers' needs.

Multimodal Information and Ticketing. Way finding at the airport is excellent throughout, not only with clear maps of the area, but also real time information for both flights and trains (KITE, 2008). Websites of Swiss Airlines, Zurich Airport, and SBB all have reasonably good information on each other and all refer the user to the appropriate site rather than doubling up on information or services.

Fully integrated ticketing is available for the Airtrain only (Swiss Airlines, 2012); all other services require separate airline or train tickets. However, bags can be checked through the intermodal transfer in both directions. These integrated ticketing and baggage transfer services are enabled because of the IATA codes now used for some SBB rail stations such as Zurich ZVV, Lausanne QLS and Basel ZDH to name a few.

Australia

Nationally, all of Australia's capital cities are connected by rail, excluding Tasmania (Williams, Greg, & Wallis, 2005). However, unlike the cases studied in Europe, Australia's densely populated areas are too far apart for rail to compete with air on intercity routes. This long-haul rail is focussed primarily as a tourist route and an alternative to bus. On regional routes, rail can reasonably compete with regional airlines. Small aircraft and low frequency timetables usually provide these services. Competition is more likely to occur with road transport.

HSR along the eastern states is being assessed and has been for many years (AECOM, 2011). So while Australia does not have any HSR yet, matching the speed, comfort, and service levels of an airline may prove difficult on longer routes.

Australia's main international airports are all leased Federal Government land and operated by private companies (Airports Act, 1996). Like Europe, this demonstrates airports are successful in being privatised.

Sydney Airport

Planning for the Sydney Airport rail-link began in 1990. The New South Wales Labour Government called for tenders to lead a complex PPP and have a completed and operational rail-link to the CBD ready for the 2000 Sydney Olympic Games (P. Zou, et al., 2008). The A$800 million Labour concept was funded, constructed, and completed under Liberal rule. The PPP required the contractor to build own and operate the rail-link under a thirty-year concession and hold an 88% stake in the partnership with the NSW government (Dehornoy, 2012; P. Zou, et al., 2008). CityRail, the city's metro train provider, operates the trains and the airport link company operate the stations (Williams, et al., 2005) and charges an access fee to recoup costs. The Airlink consortium receives the rent revenue from the stations and the entire contract will be taken over by RailCorp in 2030.

After only six months of operation, the private consortium had placed the airport rail-link into receivership due to poor patronage. After several fee and share adjustments, the company has continued to operate. This arrangement now includes the latest revision in March 2011 whereby RailCorp now pays the access fee at non-airport stations that used to be charged to passengers (RailCorp, 2011). Correspondingly, patronage has improved (Craik & Sutton, 2011). The airport rail service has never been developed beyond an airport-CBD line; passengers must change trains to access the larger city and regional network.

Funding. The funding model sought to make revenue from the airport rail stations only. In an attempt to achieve better financial results, the consortium raised access fees to the airport stations further driving customers away (Baker & Nixon, 2006). This reflects the micro-economic view of the project as an airport-CBD link only. With the government bailing out the original operating company, the company's finances are now improving, but the image of a poor investment and the effects of PPP are affecting the public's view on further development of rail-links to airports in Australia, such as Melbourne. Funding issues could have been reduced if extra-network revenue had been considered.

Sydney Airport is disadvantaged in their ability to capture land value increases as the surrounding land was already substantially developed at the time the link was built (Doherty, 2004). Vacant land was rare; but still, land value taxes could have been considered at the time of the build to capture some revenue. The opportunity was passed by however.

Government subsidies of RailCorp was 61% in the 2010-11 financial year (RailCorp, 2011). This shows the network beyond the airport link is not profitable either. The entire system is very reliant on subsidies for not only capital development but also operating costs.

Competition Airports. Canberra Airport is actively perusing the possibility of becoming Sydney's second airport connected by HSR, publically announcing plans for airport rail station designs. Additionally, Canberra wants to be a HSR hub as part of this strategy (Canberra Airport, 2012). To the north of Sydney is Newcastle airport, but Newcastle currently only operates domestic traffic. Perhaps the biggest threat to Sydney is the development of a new Greenfield airport in the region to cope with Sydney's capacity issues (James, 2012).

Alliance Models. There have never been any airline-rail alliances using the AirportLink service; they are treated as separate entities, despite the small cost from a marketing perspective to include at least a one-way ticket from the airport by an airline.

Catchment. The airport processes 35.6mppa, which makes Sydney International Airport Australia's largest airport (SACL, 2010). The patronage of the rail line had originally been estimated to be an over optimistic 48,000 passengers per day, but had only achieved 16,000 once in operation, some 66% less than forecast (Williams, et al., 2005). Now the train has improved somewhat and achieves 14% total modal share (Craik & Sutton, 2011; SACL, 2006).

Only 36% of passengers, 22% meet and greeters, and 6% staff travel to the airport from the CBD. This shows that better integration throughout the entire network is required if an increase in catchment is to be achieved (SACL, 2006).

Frequency and Reliability. The eastern coastal regions of the state are fortunate to receive regional rail services from Sydney on six lines, including three daily services to Canberra and over 40 to Newcastle (Countrylink, 2012). The metropolitan region has regular double deck services on most lines, including the Eastern Hills line, on which Sydney airport has two stations on the purpose built line. The use of commuter trains meant, at least to start with, the frequency was very regular during peak services, but poor during off peak. The non-dedicated service also means the reliability and frequency are out of the Airlink consortiums control. Across the entire CityRail network only 92% on-time performance has been achieved in the 2010-11 financial year (RailCorp, 2011).

Journey Time. The Sydney airport link fell 33% short of forecast passenger use, because passenger satisfaction and journey time was inferior to taking a taxi on the short route, despite the ticket costing half the cost of the alternatives (Williams, et al., 2005). For regional routes the journey time was significantly longer than cars. Trains can operate at 115km/hr, but the older infrastructure and challenging terrain is a limiting factor on the speed trains can practically achieve on these routes especially when compared to the freeway network. The best example of this is the one-hour forty-five longer it takes to travel to Canberra in a train over a car.

As the rail-link is currently focussed on the CBD it is prudent to highlight some of the issues with the current journey times. The short distance from the airport to the CBD meant that time spent waiting for infrequent trains was better spent in taxi's or shuttle busses which take passengers direct to their final destination. There has also been a significant increase in the number of minibus services providing a convenient means of accessing both the inner city and outlying areas.

Price. Cost on regional routes attempts to overcome the significantly slower journey times with a capped ticket price of $20.20 for the CityRail inter-urban network. Services to Canberra are beyond the CityRail boundaries, but are still significantly less expensive when compared to the real car operating costs.

For the current CBD focus, if two people are travelling to downtown Sydney, it is usually faster and less expensive to catch a taxi (Baker & Nixon, 2006). Taxis also take you directly to your destination removing any need to walk from train stations or connect to subway trains.

VOT. The graphs of VOT versus distance, Appendix A, show rail performing poorly in both leisure and business VOT due to the slow rail services.

Seamless Travel. While the airport rail stations are on a through line, the full extent of their capability is not utilised. The airport line has the ability to continue to regional services, in addition to the few local stations up-track.

The airport is lucky to have the rail station located underneath the airport terminal and provides indoor access for intermodal transfers. Initially, there was a significant lack of way finding signage which was in part to blame for the poor patronage first experienced (Williams, et al., 2005). This has now been overcome.

Multimodal Information and Ticketing. AirportLink, CityRail, and Countrylink do not integrate their websites. A passenger must know where to find relevant information and must use multiple websites to book online and separate ticketing between city and regional services. While local passengers may know where to find timetable data, a visitor is unlikely to know.

Brisbane Airport

Brisbane Airport is located 18km from the city centre and processes 20mppa through two terminals (BAC, 2011). The two terminals are 2.4km apart and are separated as domestic and international terminals. An inter-terminal bus and the Airtrain connect them.

Brisbane has eight rail lines radiating from the city centre, including the airport line. The majority of citizens live in coastal regions; south towards the Gold Coast on the NSW state border and north towards the Sunshine Coast. To reach the north by train, passengers much change trains in the city. To the south, there are no frequent services beyond the Gold Coast (one hour and forty minutes from the airport), despite significant populations being south of the NSW border.

The Airtrain rail service is located at the end of a purpose built rail line connecting the airport to Brisbane. The majority of services travel from the airport via the city to the Gold Coast, a popular tourist destination south of Brisbane. The service is operated by the state owned QueenslandRail which was formed solely for passenger services after the privatisation of the freight and coal portion of the company in 2010 (QueenslandRail, 2012). However the airport line is owned and maintained by the Airtrain consortium.

Funding. The airport rail-link began service in 2001. Built under a PPP arrangement between Airtrain Citylink and the Queensland Government (Dehornoy, 2012), it was built at no cost to the State or the then state owned and vertically integrated Queensland Rail at a cost of $233 million in return for a 35-year concession.

Like Sydney, a significant overestimation of patronage was a key source of the rail-links apparent failure. Realised demand was 88% less than forecast (Williams, et al., 2005) which caused the rail line to cut back services to every thirty minutes and only operate until 8PM daily. In turn this meant the service did not improve patronage because of the poor availability of the service. The consortium was financially restructured in 2005 when ABN Amro purchased a 50% stake in the company despite $205 million in losses, including $125 million written off by the State Government (Williams, et al., 2005).

Competition Airports. Gold Coast Airport is a significant threat to Brisbane and has grown reasonably well over the last decade to a modest 5.5mppa (QAL, 2011). The airport now boasts international services daily from New Zealand, Japan, and Malaysia.

The Gold Coast line is planned to be extended to terminate at Gold Coast Airport sometime in the future (Gold Coast City Council, 2007), which will provide interesting case study in the Australian context in assessing multi-airport competition. Gold Coast Airport has included this extension in their master plan to be completed by 2031 (GCAPL, 2011).

In addition to planning for the heavy rail line to be extended from Varsity Lakes to the airport, the new Gold Coast Rapid Transit tram network will eventually run via the airport and phase one is currently under construction. This is likely to attract more of the Gold Coast travellers away from Brisbane airport and therefore the Airtrain also.

To the north, the Sunshine Coast airport is also a potential threat in the long term, though at present it is a minor player in the passenger travel market. The airport currently only processes 1mppa from domestic services and has only one international destination - Auckland - during peak season only (SCA, 2012).

Alliance Models. There are currently no intermodal alliances via the airport worth reviewing in the context of this report. The fact that it does not is what is of interest. The only service remotely like an alliance is the agreement Virgin Australia has to transfer passengers between the international and domestic terminals, which is a service which is free to the customer.

Catchment. Currently, the train achieves a low 5% of modal share and the catchment population of the airport is very dispersed. Only 21% of passengers originate in the suburbs between the airport and the CBD, which shows demand on the rail network would be greater when focused on the surrounding suburbs. The line currently focuses toward travellers to the Gold Coast; however, only 4% of passengers originate in the Gold Coast region and along the total length of the Airtrain route a modest 31%. To the north along the Sunshine Coast Line a further 31% of Airport passengers originate. These passengers are inconvenienced by the need to change trains and this has been identified as an area of further expansion in the future (BAC, 2009).

The airport has now estimated the use of the rail-link and forecast a modest 8.8% target by 2029 (BAC, 2009), well short of the original 2.7mppa originally forecast in 2001.

The focus of the Airtrain's catchment is regional, but only on the one dedicated line. While passengers can access the remainder of the city, regional, and national rail networks, they must do so via connections. The service would have reasonable potential to grow if a dedicated service to the Sunshine coast were started; and thus could increase frequency to the CBD.

Frequency and Reliability. The self-imposed curfew has been adjusted to 10PM to allow for more evening passengers (Airtrain, 2011). However during peak periods the train only operates every 15 minutes, and only every 30 minutes at other times. Compared to the convenience of bus services and the reasonably close proximity to the CBD, the low frequency is largely to blame for the poor patronage.

Like Sydney, only metropolitan commuter trains serve the airport. There are no other classes of service or speed available to the passenger. To achieve better class of service, a passenger must choose other modes.

Journey Time. There are only two regional routes with frequencies worth researching in the context of this study; therefore only these two are plotted in Appendix A. Beyond the CBD, rail preforms poorly for the regional traveller compared to road modes. Numerous stops slow the journey whilst cars travel on the freeway for their entire journey.

Price. Ticket price only becomes beneficial to the passenger over travel by car at a distance of 80km. But as the rail lines do not extend frequently beyond the two rail lines graphed, only the very end of the regional routes become equal or better cost to the passenger.

VOT. As a result of slow journey times, VOT performs very poorly for rail at almost double the cost to both leisure and business travellers over both car modes.

Seamless Travel. At the airport the train station is highly visible. The advantage of being an elevated rail line is that it is self-advertising. For those passengers who may not have thought about using rail and choose other modes, they may be likely to enquire about the service on their return journey. One pitfall of the design is that the rail station is not enclosed like the other three case studies, and does not provide the same level of protection from the wind, rain and heat.

Multimodal Information and Ticketing. The train service has good way finding for passengers and manned ticket booths ensure good customer service. As there are no alliances at the airport, there is obviously no integrated ticketing. The only ticketing remotely intermodal is the Virgin airlines Domestic-International transfers.

A significant issue with the Airtrain worth highlighting is that Robina station (the most central stop in the Gold Coast) is 8km from the nearest hotel strip and 16km from the main tourist area of Surfers Paradise. Thus passengers need to transfer to taxis or buses to access their hotels. Airtrain improved the service by offering free shuttle services from Robina to passengers' hotels (Airtrain, 2012).

Summary

This chapter has presented the collection of the information required to answer the ancillary questions outlined previously, on the elements of competitive strategy, positioning of strategy, and the funding of the rail-link. The four case studies outlined here show a varying degree of success and influences both within and outside of the control of airports, airlines, and rail companies. Using the success factors of airport rail-links outlined in the literature review by Cokasova (2005), Eichinger and Knorr (2004), and Kouwenhoven (2008), each of the case studies contribute to their environment and current strategies that will be analysed in the next chapter. VOT is a significant success factor in causing a passenger to choose one mode over another (Givoni, 2005). While there was no one publication with this VOT data for the case studies, there is enough to compare modes. As this study is not trying to fond monetary figures on VOT, rather it is simply finding the passenger preference of one mode over another.

Without going into any analysis in this chapter, it can be seen from the results alone that the environment for rail in Europe is vastly different to that in Australia. Funding and the factors which effect customer choices on modal travel are all important to the modal share a rail-link or alliance can enjoy. These factors and results will be discussed further in the next chapter.

Chapter 5: Discussion

In this chapter, the discussion will attempt to answer the research question *"Are regional airline-rail alliances beneficial to airports as a competitive advantage?"*. This will be achieved by discussing the three ancillary questions individually. Firstly, Porter's (1979) five forces of industry competition will be used to understand *"What elements form competitive strategy in the industry?"* Then, "*… the differences between the strategies of successful airports and failures?"* will be discussed with the aid of Porter's (1980) model of three generic strategies. Finally, whether "*…rail infrastructure can be constructed and operated without government financial support?"* will consider the last ancillary question. The conclusions of these ancillary questions will then attempt to answer the research question.

What Elements Form Competitive Strategy in the Industry?

The purpose of this first ancillary question is to understand the threats and opportunities that are common to all of the case studies. The case studies will be discussed, using Porter's (1979) model of five forces of industry competition. This should aid in understanding similarities, differences, and the way different case studies approach or combat the threats and opportunities presented to them. The businesses and influences within each of the five factors are outlined in Chapter 3.

Suppliers

The suppliers discussed in this study are regional airlines, rail, cars, and any intermodal alliance. To an airport, whether passengers arrive by regional airlines or regional rail is relatively unimportant, these passengers will still transfer at their airport. Therefore revenue can still be generated from the passengers.

Airlines have considerable negotiating power with airports, as they are relatively easy to relocate to new airports. Airlines often lease facilities or subcontract services at individual airports; therefore shifting focus from one airport to another is relatively simple. Airlines are consequently easy to attract to an airport. The threat to airports is if their competition airport attracts the long-haul airlines and as a result, the feeder services too.

Cars too are an easy mode of transport to attract to an airport. They are normally available on demand, can take a shorter route than rail, and are less expensive than air. On short distances, including segments which regional aircraft and trains would operate, cars offer a door-to-door service that no other mode can. The benefits of car travel are evident in the journey time results of Zurich, where the terrain limits the speed and journey time of rail. Because of these reasons, the car is considered in this study to be the prime competitor to rail.

Rail on the other hand is a fixed asset requiring significant amounts of public money invested in the capital construction. Therefore, to start or stop services becomes a significant political decision. In all four cases, heavy subsidies contribute to the operation and capital investment of national railways to continue its success, ensure its survival, or keep it from closure. However, integrated with airlines, a benefit to an airport is the large amount of capacity offered in this mode and costs compete with cars, as shown in all cases.

Local rail services simply replace existing bus services from airport to city centre, therefore the ability to justify the building of these networks may be difficult as road infrastructure is already in place and being used by bus and car access. However, regional rail access, even using classical trains, can benefit from increased revenues as a result of the time advantages over traditional road access (European Commission, 1998a). Providing regional rail to airports provides the rail company with a previously untapped passenger base, and do not have to contend with catchment area issues at one end of the route. Passengers who were previously put off by a bus or local rail transfers via a central station may have hired cars, driven themselves, or were unaware of the service regional rail could offer. Now these passengers have direct access to their regional city of town.

From the case studies, it is clear that the extent the rail company is networked has a bearing on how attractive the airport is to passengers and therefore an airline. Frankfurt and Zurich are both well connected and offer various options for passengers to travel by rail. Their seamless travel to extended networks, frequently accessing their entire country by their national rail companies, and supplemented by other rail companies providing international services.

The Rail&Fly and Swiss baggage models offered in the two European cities offer passengers with easy low-stress travel, for a small price. Passengers are able to access these offers and many regional services direct from the airport, from anywhere across each nation respectively. Whereas Sydney is focused on the short route between Wolli Creek and the CBD, and Brisbane is only marginally better with one limited regional line, any such offering on this would do little to benefit the passenger.

The type of rolling stock offered by these has an effect on how attractive rail is to a passenger. Frankfurt and Zurich have a range of options ranging from first-class service on express HSR to local suburban trains, whereas Australia offers only metropolitan trains on single routes.

For alliances to operate successfully, the service quality of the airline needs to match as closely as possible (Cokasova, 2006). Lufthansa and Deutsche Bahn HSR trains do just that with the comfort and hospitality on board being very similar to that expected on-board an airliner, this is equally true for the Swiss-Airtrain model. Perhaps the use of suburban trains in Brisbane is why there are no alliances. No doubt the short CBD route offered by Sydney is not worth any airline forming more strategic alliances here.

The frequency offered between the airport and the CBD by Frankfurt, Zurich and Sydney are all less than ten minutes on average. This is an excellent service offering enabled in part by these airports being located on a through line. Through lines extend service beyond the airport and thus increase the line's catchment without any need to be integrated as part of a regional network (Cokasova, 2003). Brisbane however, is the final stop and cannot supplement patronage and therefore increase frequency of services, without significant subsidies. While frequencies can alleviate stress of travelling and encourage higher patronage (Cokasova, 2006), reliability is out of the control of the airport and could use improvement in all cases. The reliability of all rail connections to airports is dependent on their rail company; none of these airports have dedicated rail companies purely for airport access.

For regional rail services, price was not normally more than car travel. As can be seen throughout both Australian models, price is much less than the real cost of car travel, and often less than the apparent costs. In Frankfurt, the cost sat between the two car costs, and appeared to be calculated as such. In Zurich the cost of rail travel was much more than car costs, which was surprising considering the city is renowned for public transport use.. This shows quite well that the ticket price is not necessarily proportional to success and other factors must play an important role, and confirms the research by both Cokasova (2006) and Kouwenhoven (2008). One of the more important factors is seamless travel.

Journey time was equal to or more than car travel for the fifteen routes studied. Major contributors to this were terrain restriction, particularly in Zurich and Sydney, and the need to change services. It should be highlighted though that HSR is well used as an access mode and has significant advantages over other modes, which may encourage rail to be used more generally by the travelling public. Journey time can be controlled through the use of more direct express services (Givoni & Banister, 2011), and competes directly with or improves on car travel. Routes such as the Frankfurt – Naumburg service then this should be considered as a serious option.

The VOT results for the routes showed the impact of the need to transfer trains. While transfer penalties were not included in the VOT graphs for each case study, the routes still required 14 to 20 minutes added for train changes at Sydney and due to good scheduling only six minutes in Brisbane. These transfers compounded the issues with their slow networks. Over all, both Sydney and Brisbane were not competitive with car travel. Regional rail travel in Europe was very similar to car travel, though the terrain was seen to be an issue on the Zurich to Baden-Baden route, where cars could take faster, more direct routes through the Swiss Alps. These negative VOT experiences negate the advantage rail normally has over other modes where rail as a passenger provides the ability to preform other tasks (Mokhtarian & Salomon, 2001).

Seamless travel is attractive to passengers and as was found in the Frankfurt and Zurich cases, there were significant jumps in patronage through respective airports once alliances were introduced. At these two airports, dozens of direct destinations are available from the airport rail station. Integrated rail stations allow ease of transfer (Cokasova, 2006), and these direct trains remove the need to change trains elsewhere. For the case studies though, non-HSR routes were studied which meant the slower regional trains did often require a change at the central city station. However, this was a choice for the passenger who could decide to take the direct HSR trains instead in most cases. This choice is not an option at Sydney or Brisbane that only offer one route each, and Sydney's is not a regional service.

The European airports have accommodated intermodal as a strategy plan and have been relatively successful. The fact the European cases may have been more influenced by the EC, RAIFF, and other studies and recommendations may have an effect on why they are apparently better. Accommodating and developing check-in desks, information kiosks, and baggage handling facilities between train and aircraft will not only encourage intermodal use but can further be prioritised for alliances at the airport. Intermodal ticketing offered by the alliance airlines is also widely available, facilitated in large by the code-sharing arrangements between the airline and rail.

Table 5: Supplier Benefits of Regional Rail Compared to Car Travel

	Frankfurt	Zurich	Sydney	Brisbane
Frequency and reliability	Excellent	Excellent	Good	Poor
Journey Time	Excellent	Excellent	Poor	Poor
Price	Good	Good	Excellent	Good
VOT	Good	Good	Poor	Poor
Seamless travel.	Excellent	Excellent	Poor	Good
Multimodal information and ticketing	Excellent	Excellent	Poor	Poor
Modal share of rail	33%	66.5%	14%	5%

Source: Summary of supplier results using a scale excellent, good, poor

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Table 5 summarises the supplier benefits of non-HSR regional rail compared to car travel. As can be clearly seen, there are significant differences between the European examples and Australia. The table clearly shows the correlation between ensuring all of the supplier benefits are maximised and coordinated and the high percentage of modal share. This shows the success factors for regional rail are the same as the success factors of airport rail-links and HSR outlined in the literature review (Cokasova, 2006; Eichinger & Knorr, 2004; European Commission, 2004a; Givoni, 2005; Givoni & Banister, 2011; Kouwenhoven, 2008; Sauter-Servaes & Nash, 2009). However, more research on the specific values regional passengers place on these factors compared to CBD-centric passengers is still required to find a more quantitative difference between this previous research and the findings of this study. Nevertheless, this quantitative difference is not required to answer the research question. One of the reasons why there are such differences in the competitive offers from rail is the difference in catchment areas.

Buyers

The catchment populations of the four airports are summarised in Table 6 as areas accessible by direct rail services within 50km, and regional services beyond this distance. As can be seen, there are similarities between Frankfurt and Zurich, and conversely between Sydney and Brisbane. European airports utilise the fact they are on through lines, significantly increasing the services in many directions, whereas in Australia, the single line focus limits the catchment of the rail-link, but does highlight the significant increase possible for their services.

Table 6: Catchment Populations

Passengers	Frankfurt	Zurich	Sydney	Brisbane
Local direct rail access within 50km	74%	72.1%	36%	21%
Regional services including connections	26%	27.9%	64%	79%

Source: Summary of catchment populations from results

Building a rail terminal at airports which are on a through line, rather than a terminus of a branch line, improves the success of the airport rail-link (Cokasova, 2003). Not only does a through line provide an increase in frequency by allowing trains to travel in two directions, it increases the number of possible direct connections. Rather than travelling downtown to connect to regional services, which increases VOT. As a result of being located on a through line an airport can become a significant hub and origin for rail services in several directions (Cokasova, 2003).

For future development, Frankfurt is focussing their catchment growth to the 2-3 hour distance areas, as they believe less than this time is already maximised. This increase in focus, and the corresponding increase in this catchment area confirm the competitive distance of rail to airlines concluded by Givoni (2005). Zurich is focused on regional growth too and specifically targets Basel with the aid of the Swiss Airtrain. This ensures the airline does not have to duplicate services at the airport while maintaining the passenger numbers and benefits of scale offered by locating a hub at Zurich. Zurich Airport benefits from this development too keeping the national and most predominant airline at their location.

Perhaps this is why Brisbane focuses their service toward Gold Coast, as the Gold Coast Airport is an increasing threat to the leisure market Brisbane has traditionally enjoyed. There is a slightly larger population to the north of the airport, but are likely to be residents who own cars. Sydney on the other hand only provides services on the single line and the majority of effort toward the CBD. The short distance and small populous of passengers in this region limits their growth.

Sydney's focus appears to be purely to continue focusing on frequency and reliability of the link with the CBD. This is despite an ability to develop services in many directions, even if they were to still operate via Central Station.

Buyers are largely driven by which catchment area to reside or travel in. In Europe, passengers will often find themselves in many different catchment areas of very large and well-connected airports. The promotion of intermodal access is a key focus of Frankfurt and Zurich to entice passengers. In Australia, secondary airports are still a low threat for international passengers, and really only a threat to the domestic market. However, expanding the focus now and learning from the success of Europe is essential to maintaining the market share over those secondary airports.

Substitution

Intercontinentally, there is presently no credible threat to airports being no longer required in the medium to long-term. The VOT of long-haul travel is presently too beneficial for air travel over other modes. For passengers to booking cruise-liners, intercontinental rail, or road for anything other than holidays is not likely. Regionally however, the continued development of HSR in Europe has seen a decrease in some specific regional air services in Europe. For example, in Germany, Lufthansa has replaced Frankfurt to Cologne and Frankfurt to Stuttgart air services entirely with HSR. Likewise Swiss Airlines no longer offer flights between Zurich and Basel. This trend is likely to continue.

While the substitution of regional services is detrimental to smaller airports, larger airports that are limited by curfews or capacity can replace regional services with larger inter-continental aircraft. These aircraft typically bring more passengers and higher service charges which further benefit the airport (Graham, 2004).

Frankfurt has begun developing itself further and now acts as an important rail hub. The airport markets itself to rail-only passengers, encouraging passengers to use their car parks and shop in their retail centres. This ensures the airport continues to grow its traditional revenue stream offered to waiting airline passengers. As these incomes are so significant to airports, protecting an airport's revenue from substitution is important. Frankfurt offers an important lesson for the future development of airports worldwide.

New Entrants and Existing Competition

All airports have competition. On a large scale for example, Frankfurt competes with other airports throughout Europe, Heathrow, Paris, and Amsterdam to name a few. They are not only competing for the aircraft to use their terminals as a hub for long-haul services and onwards regional connections, but also as a destination for tourism and business. Similarly, Brisbane and Sydney compete with each other and Melbourne as a destination for tourism in Australia. This large-scale competition is ever present, good onward connections to key regional destinations by air, rail, or road is ideal for tourism and provides the first impression of the airport, region, and nation.

More locally, competition is also present in all the case studies. As has been previously mentioned, in Europe large airports are never far away from each other. Cologne Airport is competition for the same market as Frankfurt, for example; likewise Basel to Zurich as and Gold Coast to Brisbane. Sydney is somewhat lucky that Newcastle is still small and Canberra is over three hours away by road or rail. But there is potential for Sydney to capture further residents from the northern suburbs away from the cheaper Newcastle with seamless travel if offered.

Of the four case studies all airports are privately owned and receive few subsidies. This shows that privatisation of airports is successful and are well placed in the market. However, the rail companies are not at all profitable on their own, and to expect an airport to solely fund and operate such a service would require strong patronage and other significant forms of income, which will be discussed later.

While having a rail-link may be a key marketing feature of these airports, the design of their terminals is a key to the success of the patronage. Frankfurt and Zurich both have excellent modern terminals designed as an integral part of the terminal, particularly Zurich which has the underneath the terminal. But Frankfurt because of the expansive precinct the terminal and station are quite a distance apart, much further than the other three case studies. Brisbane is clearly visible and immediately outside the terminal and Sydney, like Zurich is underneath. So while integration with the terminal may grow the service there is no evidence in this study to suggest that the proximity of the station is the answer to modal share.

As this discussion has progressed through Porters (1979) five forces of industry competition, the case studies have confirmed the research reviewed in Chapter 2. This is not a great surprise, but further validates the decision to use these factors and results from the largely HSR orientated intermodal alliances and success factors for regional rail. These discussions of the case studies will now be analysed further to find the more generalised strategies of the various case studies.

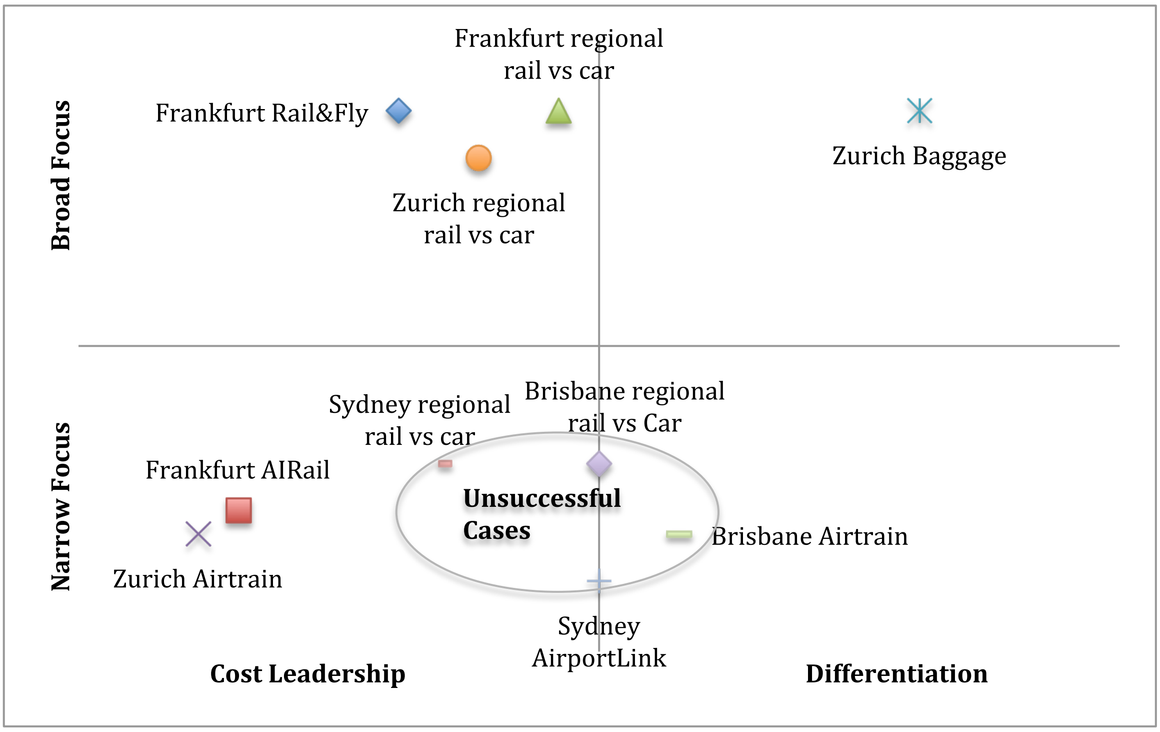
In summary, the elements that form competitive strategy have been found. For suppliers, airlines, airports, and rail companies, should ensure all of the success factors are maximised and coordinated. This study shows where these factors are maximised, modal share is high, and confirms the work by Cokasova (2006), Givoni (2005) and others. Buyers are affected by the addition of rail services to an airport and increase the catchment area, or the catchment population where this distance has been maximised. Substitution of airports is unlikely, but substitution of airlines by other modes, including rail is highly likely for regional routes where there is a time advantage. New entrants should seek to establish rail networks now, which are expensive, but should help maintain modal share. Overall, the common elements to regional rail have been confirmed to be similar to those reported in the literature review, and justify the basis for using these elements for this study.

What are the Differences between the Strategies of Successful Airports and Failures?

Now that the common elements of industry competition are understood, the study will now compare the case studies. This should find differences between the successful and unsuccessful airport rail strategies from a whole of industry view. Porters (1980) model of three generic strategies will be used as the model to compare these results. The model was described in the literature review as three distinct strategies of cost leadership, differentiation, and focus.

Focus in particular was outlined as being limited to geographic, demographic, or other such boundary, but still containing some elements of cost leadership or differentiation (Porter, 1980). Figure 7 is a slight modification of Porters model and shows the three strategies, with cost and differentiation being the x-axis, and narrow or broad focus as the y-axis. All models that fall below the x-axis are therefore focus strategies. The various models, alliance or not, are plotted on the chart to find any common strategies which may contribute to the success or failure of our case studies.

Figure 7: Case Studies Plotted against Porter's (1980) Model of Three Generic Strategies



Source: Author

Cost leadership requires companies to manipulate their external expenses and pass off these low costs to buyers (Porter, 1980). The models found in this part of the graph are the Frankfurt and Zurich regional rail models versus the car. Deutsche Bahn and SBB are heavily subsidised by the government to ensure the success of their services, therefore these two models have positioned themselves to be very similar in cost to car travel, with the deficit in operating costs apparently covered by the subsidies. The slight difference between the two models is Zurich is restricted by terrain that limits the benefits of rail over car travel times. Frankfurt Rail&Fly offers a cost leadership by attracting passengers away from secondary airports to Frankfurt rather than via regional airlines, it is cost effective for the passenger to travel this way and encourages these passengers to use the alliance airlines, reducing the need to provide feeder air services.

Differentiated strategies require a customer to distinguish a service as more superior than other offers (Porter, 1980). The only broadly focused differentiation model studied is the Zurich baggage offerings by SBB. The model costs passengers and service providers for the offer, but is aimed at increasing the customer experience and satisfaction across all of Switzerland.

All other models studied have been found to be focus strategies. Two models of note are the Frankfurt AIRail and Zurich Airtrain. Both are focused as they only offer access to a limited number of specific locations. Both airline alliance partners offer the service to remove the need to provide airline services to these popular locations, concentrating passengers on their hub airports, reducing costs at their secondary airports. The slight difference between the two models is AIRail offers two destinations on faster HSR trains.

The other four models found to be focus strategies are from Sydney and Brisbane. They offer little or no differentiation over car travel and the significant cost savings, through Sydney's subsidised capped-price tickets for regional travel, is not enough to outweigh the VOT costs to both leisure and business travellers. These poor VOT figures are a result of terrain-restricted speeds and the need to change services at least one other station. Brisbane is restricted because there are only two regular regional rail routes offered and neither is faster than a car nor are they cheaper for the passenger.

Looking at the models offered at each of the case study airports, the two successful cases, Frankfurt and Zurich, do have something in common. Both cases strategic offers are spread across the strategy chart. From entire network models, to specific code-sharing routes, and Zurich's differentiated services, these successful models and alliances can attract passengers from other airports and through the alliance airport instead. Referring back to Figure 5, both of these airports also have high modal shares for rail.

The two Australian case studies are grouped closely together as focus strategies. Even within this generic strategy of focus, they have not ventured too far toward cost leadership or differentiation. It is noted that there are issues with the infrastructure and terrain that limits the competitive position over car travel, and the two airports do not have the same levels of competition from other nearby airports as the European cases do. Because of the low ticket-price for regional journeys, there is potential in Sydney and Brisbane to capture regional passengers if they were to develop their competitive strategy with faster journey times, and more multi-modal ticketing. There are still lessons that can be learnt and employed to be more successful. Broadening the diversity of their current strategies is certainly one such improvement.

From a holistic industry point of view, there are differences between the successful cases and the unsuccessful. The more spread the competitive strategies, the more successful the modal share. However, this study is attempting to address the benefits of alliances to competitive strategy.

Regional Alliances

Narrowing consideration of Figure 7 to regional alliances, there is evidence that airline rail alliances are beneficial to airports in growing passenger demand. It is only through the use of alliances across the airport region, for baggage handling and code-sharing passengers, which allows Frankfurt and Zurich to expand their competitive position to all of the generic strategies of Porter's (1980) model. Additionally, both airports reported significant increases in passengers through their airports when Lufthansa and Swiss Airlines introduced alliances with Deutsche Bahn and SBB respectively. The Lufthansa-Deutsche Bahn model was most likely a result of relocating passengers from Cologne. The addition of baggage handling services made the code-share rail more attractive to passengers as a surface access mode in competition to regional rail routes.

The airline-airport-rail alliance should work together when able to, to design terminals to enable quick passenger flows. This might include short walks for passengers, convenient location of security services, and gates for the alliance airline near train platforms to show a comparative ease for alliance passengers. It is primarily the responsibility of the airport to provide adequate planning and control of the flows and layout of terminal services (Albers, et al., 2005). However, airlines can assist in this by moving some check-in services to remote locations, such as downtown rail stations (Sharp, 2004). Albers, et al., argue that this is the responsibility of the airport solely, however, the benefits of remote check-in are beneficial to airlines and rail and thus the alliance have been found to be part of Zurich's success with remote check-in and baggage transport services. Improving this interaction with smooth transfers onto and between modes should increase satisfaction with the alliance (Weber, 2005; Weber & Sparks, 2004). Also, to provide quality connections, just as any hub airport does, provide regional and or long-distance trains to arrive and depart in time with alliance airline schedules, so passengers need not wait too long, vice other passengers who may need to wait some time, or connect through metro systems to dedicated airport-city trains. This also allows for a variety of destinations and improves the alliance's image.

One form of alliance not plotted on the chart, is key to the integration of a regional wide transport agency. While both Sydney and Brisbane do have these agencies within their government, they are by no means at the same level of public service focus as the European Verkehverbund models. Public and private companies should look to form closer relationships and possibly alliances to cooperate and grow the public transport network, as it is evident that the current Australian models are not competing against car travel. This is dependent on the view of the government however, and is reflected in the funding models employed in Europe and Australia respectively.

The attraction of passengers by airline-rail alliances, away from other modes and secondary airports, is a competitive strategy that can be employed by airports. This answers the research question of this study. However, before it can be employed at an airport one needs to understand if the airline-rail alliance can realistically contribute to the operating costs and infrastructure growth to support the alliance – particularly of the railway networks.

Can Rail Infrastructure be Constructed and Operated without Government Financial Support?

Now the previous two ancillary questions have been addressed, the final question will consider funding. The success of private financing to recover investment costs will be discussed to find how much private investment is realistically possible. This will allow projection of the conclusions for future airport rail-link projects.

Based on the four cases in this study, there is not enough income earned through fare-box revenue to justify operational cost of the rail network, let alone fund capital investment. All four rail networks receive subsidies for their passenger services. This confirms the statement by Salon and Shewmake (2011) that railways are usually too expensive to recover costs through ticket sales alone. While actual subsidies for airport specific rail lines could not be accurately estimated, the opinions of those interviewed and the general literature results of Zurich and Frankfurt show there are very large subsidies required irrespective of patronage.

In Germany and Switzerland rail is considered a public service, their governments realised the need to subsidise and even pay entirely for the development of their airport-rail-links from the outset. It was less of a consideration of cost recovery was given, than simply the need to have a rail line to the airport (Bahn, 2012), they were usually built with grants given directly to the national rail provider.

In Australia however, Governments have attempted to reduce costs to the public purse through the use of PPP. As outlined in the results previously, Sydney and Brisbane suffered due to poor patronage forecasting prior to construction (Flyvbjerg, 2008). The costs of the infrastructure were not being met due to low patronage (Williams, et al., 2005). These projects were justified using the forecast figures. So a PPP would have been far more likely to succeed if the forecasting was more accurate. Because of this, the PPP had based their cost recovery more heavily on fare-box income. Sydney and Brisbane have added significant surcharges to their fares and both airports have low patronage for their focused catchment areas. Perhaps this reliance on capturing investment costs caused, the significant potential for other forms of income, such as land value capture, was overlooked.

From the four case studies reported here, all required government support for the funding of capital investment and operating costs. Though there are differences between Europe where government's view of airport rail-links as a public service, and Australia that show the governments prefer the rail-links to pay for themselves. From either region, the holistic view shows there rail is a significantly expensive transport infrastructure that can rarely be independently funded.

Regional Alliances

The alliance model may be a success in attracting passengers to the three alliance members – airline, airport, and rail company. However, there is no evidence in this study to suggest there is enough additional demand to justify the funding of the required infrastructure by the alliance themselves. The evidence in this study suggests that a regional alliance would simply provide an additional travel mode on specific routes to compete with regional air services. The additional patronage is unlikely to contribute to the total operating expenditure, let alone the capital investment.

Therefore, it can be concluded that airline-rail alliances do not have a significant role in investing in capital infrastructure of alliance networks. This conclusion confirms the position of Frankfurt airport, which states the national railways have the public task to provide public transport where it is necessary. Therefore, in order to implement these best strategies and to allow for more private investment, the government still has a large role to play in facilitating this development (Salon & Shewmake, 2011). This is done in all of the case studies researched in this study.

Are Regional Airline-Rail Alliances Beneficial to Airports as a Competitive Advantage?

In summary, the elements that form competitive strategy confirm the literature reviewed in Chapter 2 and address the first ancillary question. The successful factors of airport rail-links are similar to regional rail alliances, and highlight the importance of addressing all factors to grow modal share.

The question on similarities in successful intermodal airports found that Frankfurt and Zurich both had competitive strategies spread across Porters (1980) model of three generic strategies. Conversely, the less successful airport rail-links of Sydney and Brisbane do not. More specifically for this study, the attraction of passengers by regional alliances is a successful competitive strategy. Passengers can be enticed away from secondary airports and competing supplier modes to the alliance airport.

All four case studies require significant government support to fund capital and operating expenses. This study summarises the third ancillary question *"Can rail infrastructure be constructed and operated without government financial support?"* as rail infrastructure is likely to require government funding. It is not the role of the alliance.

Chapter 6: Conclusions

This chapter will summarise the results, discussion and recommendations from the previous chapters of this study. Why this information is important to industry, limitations of this study, and potential areas for further research will also be put forward.

Prior to this study, academic research in the field of airline rail alliances centred on HSR. Extensive literature was available on HSR in Europe and the effect of catchment areas and competition with airlines was understood (Givoni, 2005). Similarly, much research on the passenger experience of intermodal transfers and VOT was available (Cokasova, 2006; Givoni & Banister, 2011). Airport rail-links are being pushed as an essential mode to major airports and there is much discussion on the practicalities of this by various organisations and government agencies (European Commission, 1998a; IARO, et al., 1998). Politics and infrastructure investment has been widely discussed and did often use rail as the industry or transport mode of review (Doherty, 2004; Flyvbjerg, 2008; Salon & Shewmake, 2011), though the research heavily references HSR, metropolitan rail or light rail transit services. There was no significant literature available that assessed the various strategies of regional rail access and alliances to airports.

The purpose of this study was to find a correlation between the strategies of successful airports with airport rail-links, and whether regional airline-rail alliances are the solution to this success. Using the comparative case study methodology this question could be answered and fill the gap in the existing literature.

The comparative case study methodology was selected, and four cases were chosen to study. The choice of the case studies was based initially on availability of information and the willingness of various organisations to cooperate. Two apparently successful and two failing cases were then chosen. This was based not only on their success, but also geography in order to understand the effect of politics, culture, and topography could have; those selected were Frankfurt, Zurich, Sydney, and Brisbane.

The research question was *"Are regional airline-rail alliances beneficial to airports as a competitive advantage?"* This was answered with a series of ancillary questions that assessed the elements, strategy, and funding for the general industry, using the four cases as evidence. The study then narrowed to assess the effects of alliances on each of these questions.

Porters (1979) model of five forces of industry competition was used as a framework to gather information and later analyse the results for the first ancillary question *"What elements form competitive strategy in the industry?"* The purpose of gathering this information was to gain an understanding of the specific factors that drive industry competition in each of the four case studies. Different strategies offered at the airports with and without alliances were outlined at this stage. Using this model a format for success and failure began to emerge, particularly from the viewpoint of the passenger. The successful elements of competitive strategy found in this study, confirmed previous research based on HSR (Cokasova, 2006; Givoni, 2005) could also be used to study regional rail.

To address *"What are the differences between the strategies of successful airports and failures?"* the study plotted all of the modal choice options. This was done on a modified chart reflecting Porters (1980) model of three generic strategies. After doing so, there was a significant finding. The unsuccessful cases, Sydney and Brisbane, were grouped together as very focussed strategies offering no great difference between cost leadership and differentiation. In comparison, the successful case studies, Frankfurt and Zurich, showed a large spread in different service offers, from narrow to broad focus, cost leadership and differentiated services.

To enable this spread of strategy, both the Frankfurt and Zurich cases have regional alliances with airlines, rail companies and the airport. Not only does this allow passengers choice, but as a result, this has been shown to increase patronage through the airport. This can attract air services away from in secondary airports. Alliances are therefore beneficial to airports as a competitive advantage.

However, the study up until this point had assumed the current financial conditions would continue with respect to government support and funding. This study considered a third ancillary question *"Can rail infrastructure be constructed and operated without government financial support?"* To varying degrees, all cases had government financial assistance to build their infrastructure. In the successful cases the link to the airport had been entirely funded by government as a public service. In Australia however, both the lines needed to repay the significant sums of capital cost and were financed through a PPP. The result was higher ticket prices for the passengers and correspondingly very low patronage in Australia. In Europe, the cost of travel is no different between travelling to an airport or to any other destination in the country. Correspondingly, their modal share is high. This is an important lesson for other airports if the aim is to move passengers rather than any need to make revenue.

This revenue however, is due to extremely large subsidies for the rail network. In Europe, rail is seen as a public service rather than a commercial revenue generating company. Even in Australia large subsidies are still required to operate the rail services. In all cases the effect of government funding for rail-links is necessary and not possible to recover operating expenditure let alone infrastructure costs from fare box revenue alone. This influence would also outweigh any competitive advantage of airline-rail alliances, and therefore the answer to the research question is:

Regional airline-rail alliances are beneficial to airports as a competitive advantage, provided the political support for infrastructure investment is present.

For literature, the study will fill the gap in extensive research already undertaken between HSR and metropolitan services and provides a strategic point of view rather than the current operational or passenger experience point of view.

These results are important to all airports and to rail companies operating to airports. Diversification of modal choice offerings is a key method of gaining passenger share through airports. Involving airlines as part of an alliance to increase their catchment should be a key strategy for airports.

This study focuses on regional services rather than HSR. This provides valuable research for airports restricted from building HSR tracks because of surrounding real estate or topography. These airports will have a better understanding of the potential they still have to invest and grow rail as a modal choice for their airports. Equally, existing airports can consider implementing these concepts for further growth of rails modal share.

Limitations and Problems

While this study does provide a good understanding of the strategic benefits and potential for implementation, it is of course limited by its ability to be generalised due to the small sample of four case studies.

Difficulties in the data collection were found with some companies being extremely reluctant to release any data or co-operate with the research. In the European cases, enough data was found from other members within the alliance to complete the picture. Some companies did provide extremely good data, including confidential reports that although cannot be used directly in this report, did provide excellent understanding of the industry as a whole and further guided the research. However, this information would have provided stronger correlations if their input was available for publishing.

The conclusion made on funding rail infrastructure was based entirely on the four case studies and literature. Much more in-depth analysis needs to be conducted to generalise this conclusion on other situations. Additionally, while operating costs and subsidies were available for each of the case studies, there was no way to isolate the costs of the airport routes and infrastructure from the rest of the network. Therefore this study compared entire networks to one another, which may not be indicative of the cost benefits to airports and airlines. Particularly in the Australian cases where large access fees are added to passenger fares and directly contribute to that specific line's infrastructure. This is an area of further research should detailed cost information become available.

Further Research

There are many new avenues for research discovered while conducting this study. Those specifically relating to regional rail alliances as an outcome from this study's research question are discussed below.

By far the most significant further research that should be done is to expand the sample size of this study from four. While it is anticipated that the results would be very similar, a large sample, ideally of the majority of the 181 existing airport rail-links would allow for much higher confidence in generalising the results and implementing the findings practically. By involving a much larger sample size beyond the two regions discussed in this study to nations such as China, Japan, Malaysia, and the USA for example would diversify the cultures and politics involved. As was discussed in this study cultures and politics have significant influence on the building and operating of airport rail-links and diversification will further assist in generalising the results.

A closer analysis of operating and investment costs of airport rail-links would be very useful not only for academic literature, but also practical application. As highlighted above, there was no way in this study to isolate operating costs and subsidies for the individual airport rail-link infrastructure. Research that could find this relationship could provide a basis for further investment in existing and new airport rail-links and pricing review.

Potential for further research on the immediate effects of airport rail-links and competition between airports is possible with future new builds. Melbourne, Australia is one such location that is considering building airport rail-links to both of the city's. There are also others around the world, outside Europe, which are starting to compete with the assistance of intermodal access. The effects of this construction on catchment areas and airport competition will have considerably rich data for literature if it is followed closely as the locations develop.

Conclusion

This study has found that airline-rail alliances can be a competitive advantage for airports, provided there is government support for infrastructure investment. The results and implications of various strategies discussed here are simply the tip of the iceberg in researching their true effects. While this study has contributed to the basis of understanding the strategies of regional rail-links, further research will help build on the findings of this study. Airport rail-links are set to continue growing in the future and research such as this will continue to contribute to the exciting growth of this industry. The industry should look at the current popular view of airport rail-links as an airport to CBD mass transport mode and seek to change this paradigm under which they plan strategy. Frankfurt and Zurich have done so and they have successfully achieved significantly larger modal share and dominate their competition. It is now essential that the existing 182 airport rail-links and the new and planned links also challenge the strategies within which they operate.

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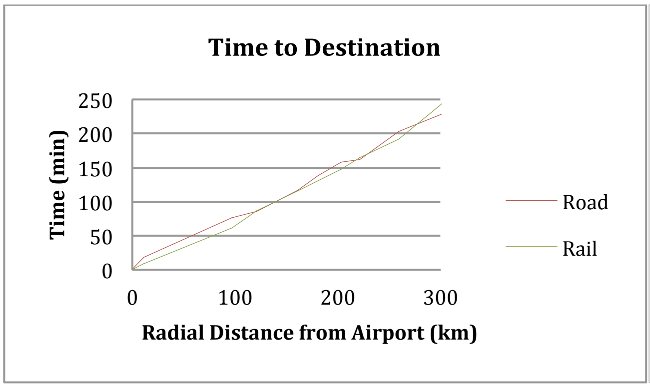
Appendix A: Case Study Data

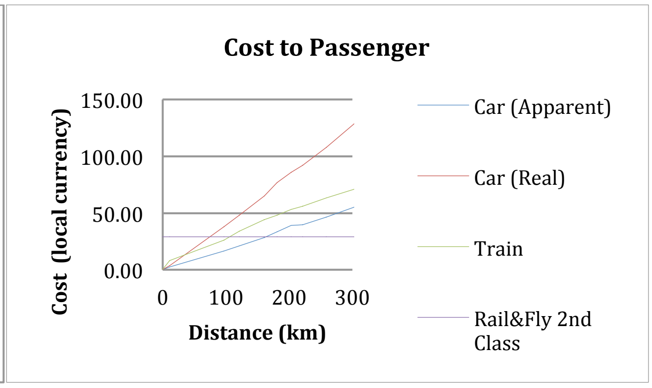
Notes on the following data:

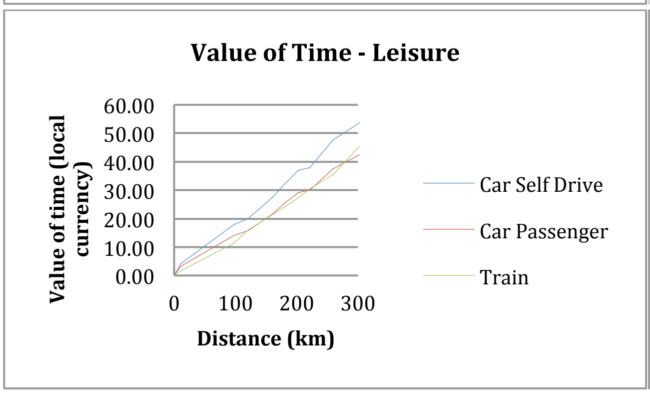
- Time to destination is the direct radial distance to each station enroute and the time taken between the airport and the destination by car and by train.
- Train cost to passenger is the ticket price as quoted on the rail company's website. All data, for all case studies were based on an adult, on a weekday, 10am departure, booked on the day.
- For cars, two costs are quoted. 'Apparent cost' accounts for fuel cost only; 'real cost' includes all other charges such as insurance, registration, and maintenance. In all cases a 1.6lt mid size four-door car was used and the latest fuel costs for each case are used. Real cost is calculated differently in between the European cases and the Australian cases, where Australia considers the cost of ownership as a daily change and per/km, where as Europe is entirely per/km. Road costs do not include any tolls.
- This data will be further calculated to show the VOT for both leisure and business travellers using recognised monetary values applicable to the each case study.

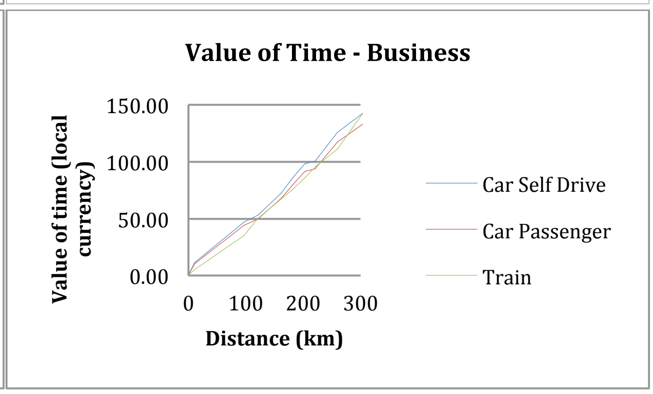
Frankfurt Airport to Leipzig

		Frankfurt Airport	Frankfurt Süd	Fulda	Bad Hersfeld	Eisenach	Gotha	Erfurt	Weimar	Naumburg
Distance (km)	Road	0	14	115	147	202	232	273	281	328
	Rail	0	11	110	153	206	237	265	286	327
	Radial	0	11	97	121	161	181	203	221	259
Time (min)	Road	0	18	76	86	117	138	158	162	203
	Rail	0	9	61	87	116	131	148	165	192
Cost (€)	Car (Apparent)	0.00	2.30	16.43	20.86	28.53	33.40	38.84	39.83	46.40
	Car (Real)	0.00	3.81	38.00	48.00	65.00	77.00	86.00	92.00	108.00
	Train	0.00	8.00	26.00	34.00	44.00	48.00	53.00	56.00	63.00
	Rail&Fly 2nd Class	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
VOT Leisure (€)	Car Self Drive	0.00	4.22	17.83	20.18	27.46	32.38	37.08	38.02	47.64
	Car Passenger	0.00	3.33	14.06	15.91	21.65	25.53	29.23	29.97	37.56
	Train	0.00	1.67	11.29	16.10	21.46	24.24	27.38	30.53	35.52
VOT Business (€)	Car Self Drive	0.00	11.16	47.12	53.32	72.54	85.56	97.96	100.44	125.86
	Car Passenger	0.00	10.40	43.93	49.71	67.63	79.76	91.32	93.64	117.33
	Train	0.00	5.20	35.26	50.29	67.05	75.72	85.54	95.37	110.98



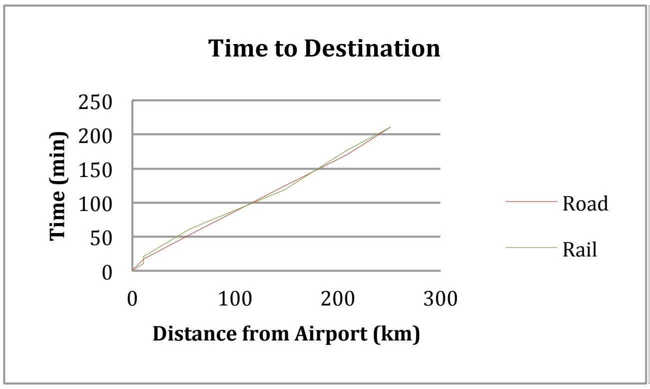


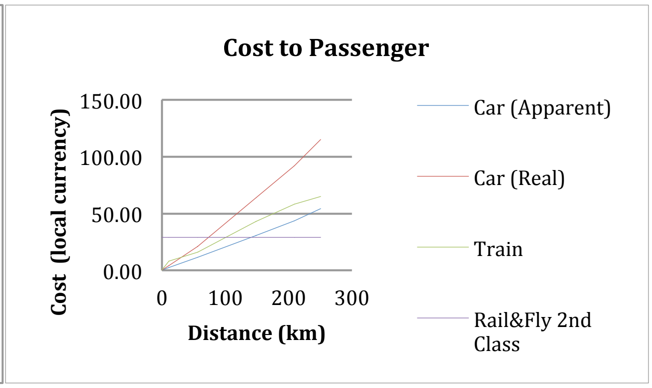


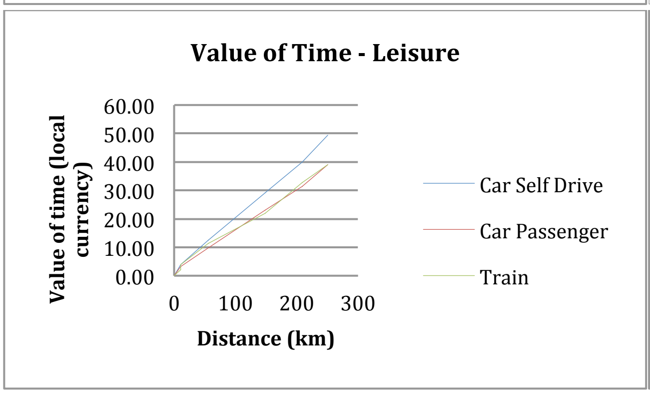


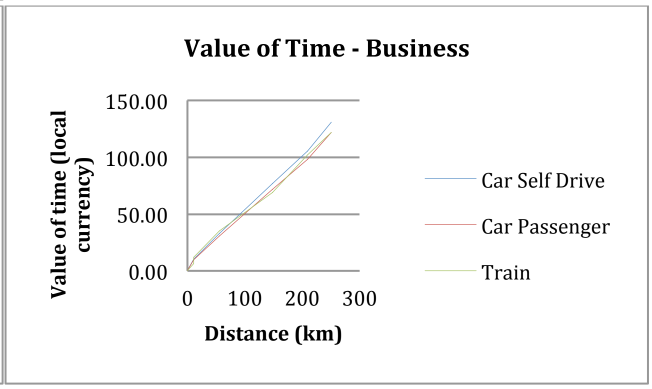
Frankfurt Airport to Augsburg

		Frankfurt Airport	Frankfurt (Main)	Change Trains	Weinheim	Stuttgart	Ulm	Augsburg
Distance (km)	Road	0	16	16	72	203	286	355
	Rail	0	12	12	76	190	262	356
	Radial	0	11	11	56	148	209	251
Time (min)	Road	0	17	17	53	124	170	211
	Rail	0	11	21	61	119	177	211
Cost (€)	Car (Apparent)	0.00	2.61	2.61	11.37	30.72	43.33	53.97
	Car (Real)	0.00	4.00	4.00	21.00	64.00	92.00	115.00
	Train	0.00	8.00	8.00	16.00	43.00	58.00	65.00
	Rail&Fly 2nd Class	29.00	29.00	29.00	29.00	29.00	29.00	29.00
VOT Leisure (€)	Car Self Drive	0.00	3.99	3.99	12.44	29.10	39.89	49.51
	Car Passenger	0.00	3.15	3.15	9.81	22.94	31.45	39.04
	Train	0.00	2.04	3.89	11.29	22.02	32.75	39.04
VOT Business (€)	Car Self Drive	0.00	10.54	10.54	32.86	76.88	105.40	130.82
	Car Passenger	0.00	9.83	9.83	30.63	71.67	98.26	121.96
	Train	0.00	6.36	12.14	35.26	68.78	102.31	121.96



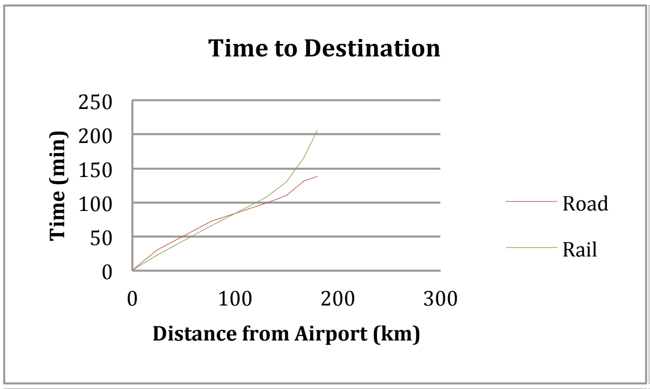


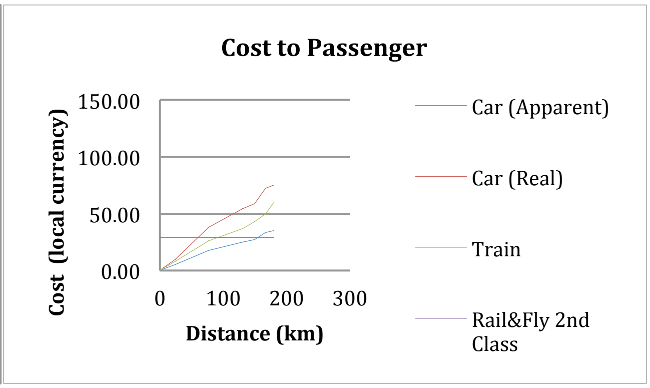


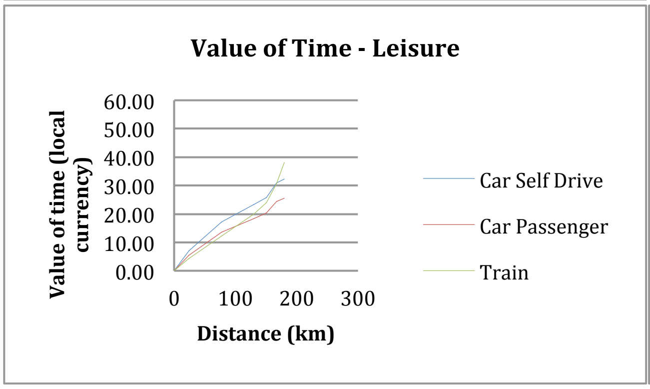


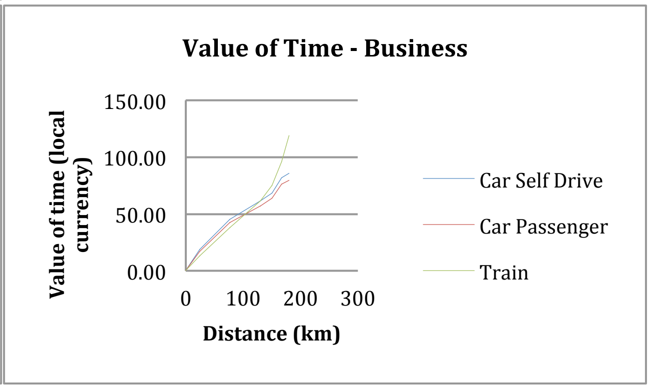
Frankfurt Airport to Dortmund

		Frankfurt Airport	Mainz	Koblenz	Bonn	Cologne	Wuppertal	Dortmund
Distance (km)	Road	0	31	115	162	178	219	231
	Rail	0	30	91	150	182	262	319
	Radial	0	24	77	130	150	167	180
Time (min)	Road	0	30	73	99	110	132	138
	Rail	0	23	66	107	130	166	206
Cost (€)	Car (Apparent)	0.00	5.12	17.89	24.72	27.23	33.56	34.95
	Car (Real)	0.00	10.00	38.00	54.00	59.00	72.00	75.00
	Train	0.00	8.00	26.00	37.00	43.00	50.00	60.00
	Rail&Fly 2nd Class	29.00	29.00	29.00	29.00	29.00	29.00	29.00
VOT Leisure (€)	Car Self Drive	0.00	7.04	17.13	23.23	25.81	30.98	32.38
	Car Passenger	0.00	5.55	13.51	18.32	20.35	24.42	25.53
	Train	0.00	4.26	12.21	19.80	24.05	30.71	38.11
VOT Business (€)	Car Self Drive	0.00	18.60	45.26	61.38	68.20	81.84	85.56
	Car Passenger	0.00	17.34	42.19	57.22	63.58	76.30	79.76
	Train	0.00	13.29	38.15	61.85	75.14	95.95	119.07



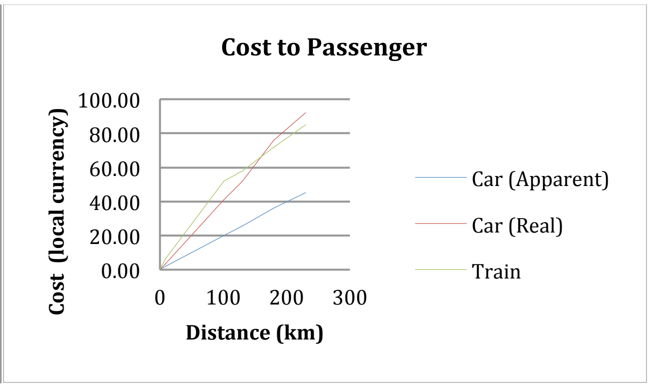


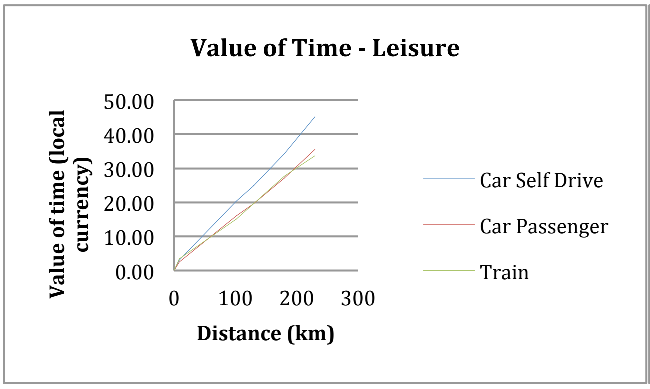


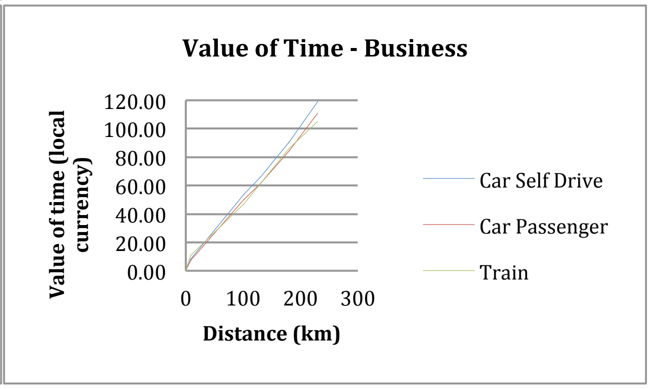


Zurich Airport to Geneva

		Zürich Airport	Zürich	Bern	Fribourg	Lausanne	Geneva
Distance (km)	Road	0	11	127	160	227	283
	Rail	0	10	117	151	217	277
	Radial	0	9	101	130	180	230
Time (min)	Road	0	13	87	106	146	192
	Rail	0	19	81	106	149	182
Cost (CHF)	Car (Apparent)	0.00	1.93	20.11	25.55	36.07	45.24
	Car (Real)	0.00	3.53	41.00	52.00	76.00	92.00
	Train	0.00	6.40	52.00	58.00	72.00	85.00
VOT Leisure (CHF)	Car Self Drive	0.00	3.05	20.42	24.87	34.26	45.06
	Car Passenger	0.00	2.41	16.10	19.61	27.01	35.52
	Train	0.00	3.52	14.99	19.61	27.57	33.67
VOT Business (CHF)	Car Self Drive	0.00	8.06	53.94	65.72	90.52	119.04
	Car Passenger	0.00	7.51	50.29	61.27	84.39	110.98
	Train	0.00	10.98	46.82	61.27	86.12	105.20

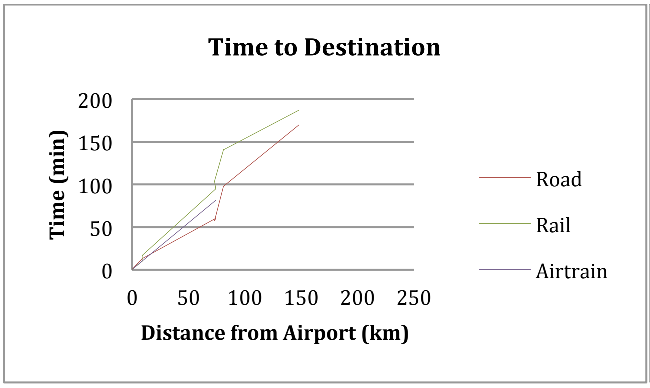


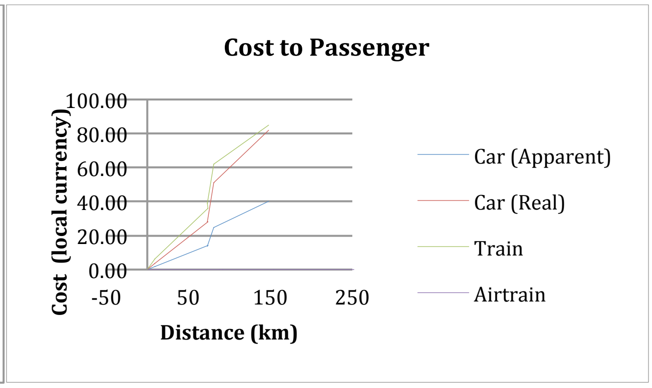


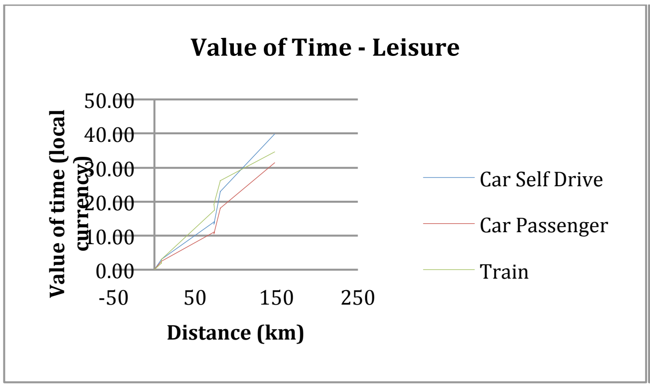


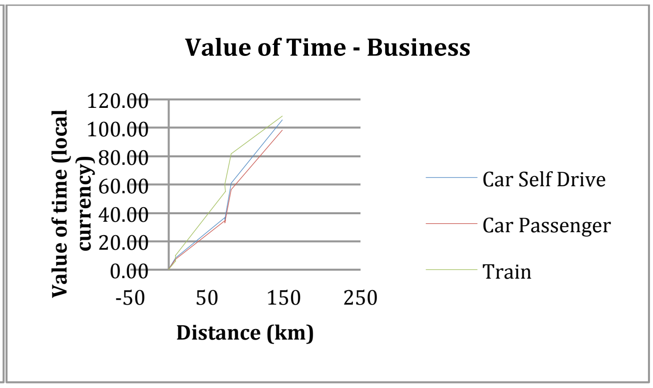
Zurich Airport to Baden Baden

		Zurich Airport	Zürich Central	Change Trains	Basel SBB	Basel Bad	Freiburg	Baden-Baden
Distance (km)	Road	0	11	11	88	88	156	253
	Rail	0	13	13	88	92	154	257
	Radial	0	9	9	74	73	81	148
Time (min)	Road	0	13	13	60	57	98	170
	Rail	0	10	17	95	104	141	187
	Airtrain	0			81			
Cost (CHF)	Car (Apparent)	0.00	1.93	1.93	14.32	13.98	24.83	39.97
	Car (Real)	0.00	3.53	3.53	28.00	28.00	51.00	82.00
	Train	0.00	6.40	6.40	36.00	39.00	62.00	85.00
	Airtrain	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VOT Leisure (CHF)	Car Self Drive	0.00	3.05	3.05	14.08	13.38	23.00	39.89
	Car Passenger	0.00	2.41	2.41	11.10	10.55	18.13	31.45
	Train	0.00	1.85	3.15	17.58	19.24	26.09	34.60
VOT Business (CHF)	Car Self Drive	0.00	8.06	8.06	37.20	35.34	60.76	105.40
	Car Passenger	0.00	7.51	7.51	34.68	32.95	56.64	98.26
	Train	0.00	5.78	9.83	54.91	60.11	81.50	108.09



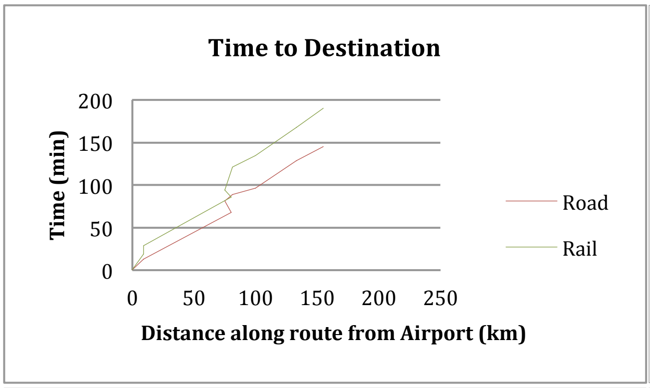


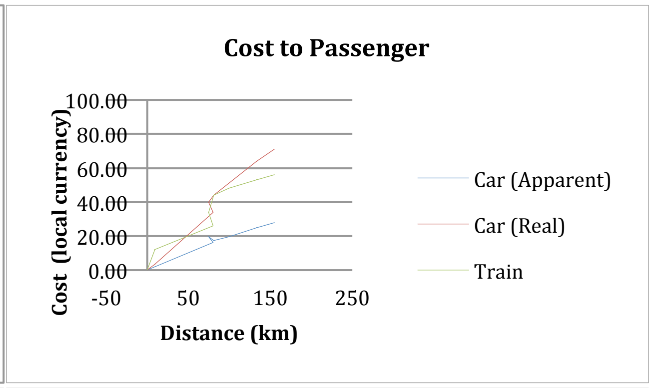


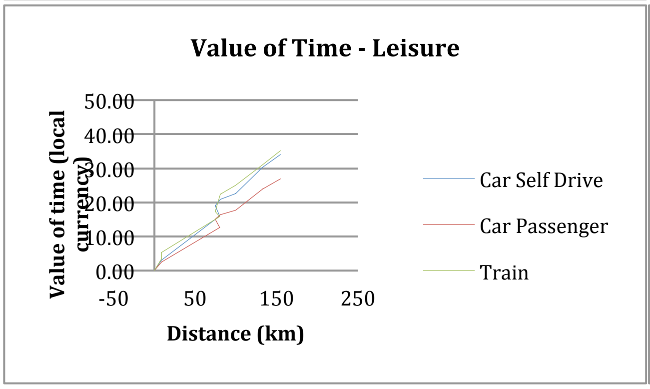


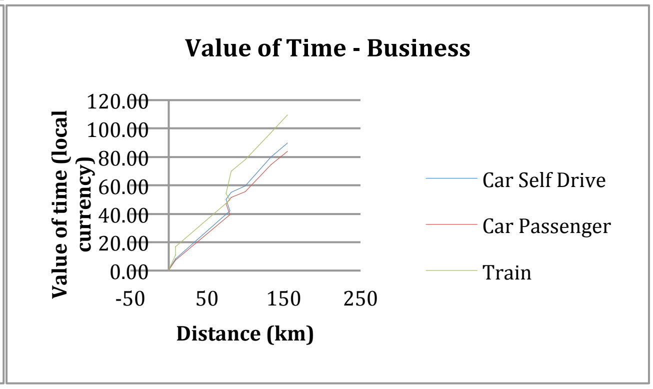
Zurich Airport to Landeck Zams

		Zurich Flughafen	Zurich Change Trains	Zurich	Sargans	Buchs SG	Feldkirch	Bludenz	St Anton am	Landeck Zams
Distance (km)	Road	0	11	11	103	124	136	153	195	220
	Rail	0	10	10	102	119	137	157	194	221
	Radial	0	9	9	80	75	81	100	133	155
Time (min)	Road	0	13	13	68	81	89	96	129	145
	Rail	0	19	29	86	94	121	135	168	190
Cost (CHF)	Car (Apparent)	0.00	1.93	1.93	16.39	19.52	17.51	19.49	24.74	27.87
	Car (Real)	0.00	3.53	3.53	34.00	40.00	44.00	51.00	64.00	71.00
	Train	0.00	12.00	12.00	26.00	34.00	44.00	48.00	53.00	56.00
VOT Leisure (CHF)	Car Self Drive	0.00	3.05	3.05	15.96	19.01	20.89	22.53	30.27	34.03
	Car Passenger	0.00	2.41	2.41	12.58	14.99	16.47	17.76	23.87	26.83
	Train	0.00	3.52	5.37	15.91	17.39	22.39	24.98	31.08	35.15
VOT Business (CHF)	Car Self Drive	0.00	8.06	8.06	42.16	50.22	55.18	59.52	79.98	89.90
	Car Passenger	0.00	7.51	7.51	39.30	46.82	51.44	55.49	74.56	83.81
	Train	0.00	10.98	16.76	49.71	54.33	69.94	78.03	97.10	109.82



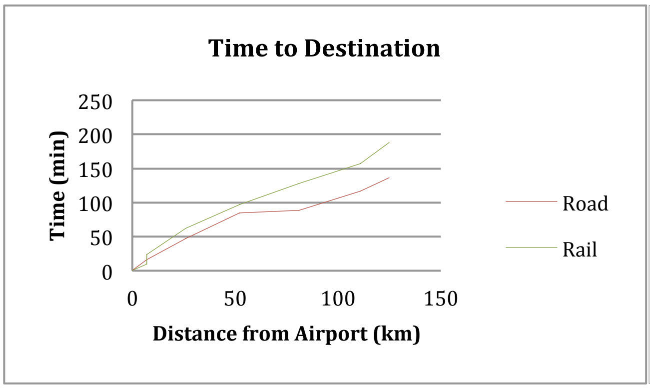


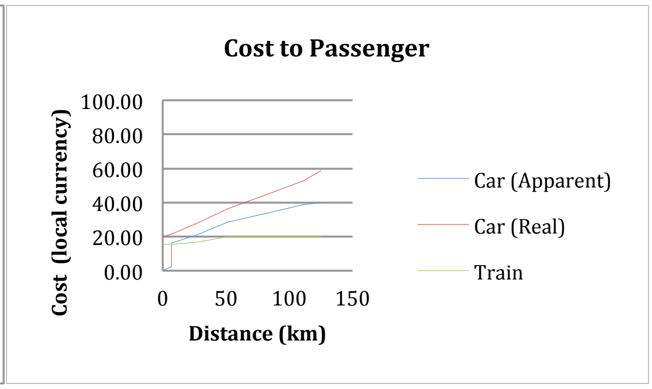


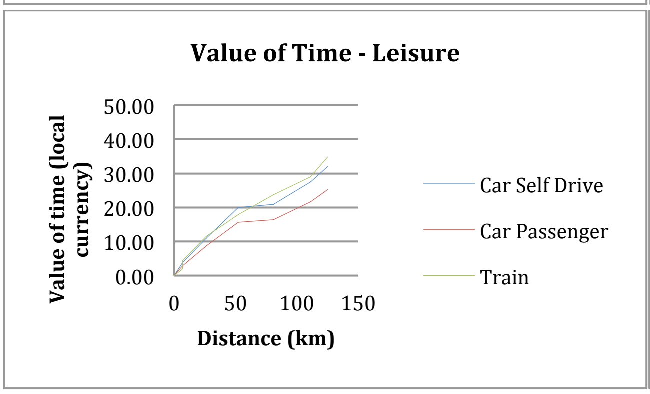


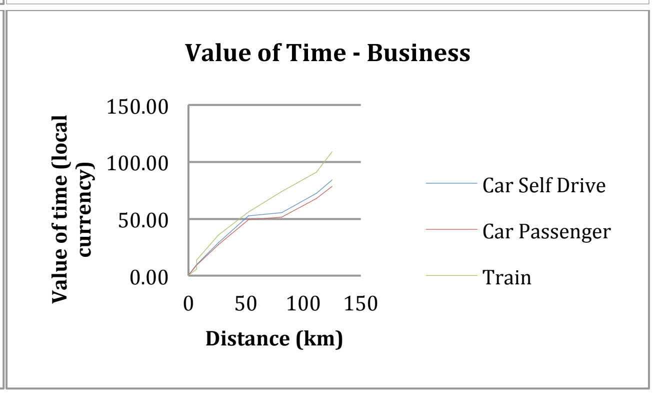
Sydney Airport to Newcastle

		Sydney Airport	Central Station Change Trains		Hornsby	Woy Woy	Warnervale	Fassifern	Newcastle
Distance (km)	Road	0	9.9	9.9	48	96	114	153	174
	Rail	0	8.4	8.4	43	80	114	150	177
	Radial	0	7	7	26	52	81	111	125
Time (min)	Road	0	16	16	47	85	89	117	136
	Rail	0	10	24	62	97	128	157	188
Cost ($)	Car (Apparent)	0.00	2.30	16.43	20.86	28.53	33.40	38.84	39.83
	Car (Real)	20.00	21.50	21.50	27.60	36.60	44.30	52.80	58.70
	Train	15.40	15.40	15.40	16.80	20.20	20.20	20.20	20.20
VOT Leisure ($)	Car Self Drive	0.00	3.75	3.75	11.03	19.95	20.89	27.46	31.91
	Car Passenger	0.00	2.96	2.96	8.70	15.73	16.47	21.65	25.16
	Train	0.00	1.85	4.44	11.47	17.95	23.68	29.05	34.78
VOT Business ($)	Car Self Drive	0.00	9.92	9.92	29.14	52.70	55.18	72.54	84.32
	Car Passenger	0.00	9.25	9.25	27.17	49.13	51.44	67.63	78.61
	Train	0.00	5.78	13.87	35.84	56.07	73.98	90.75	108.66



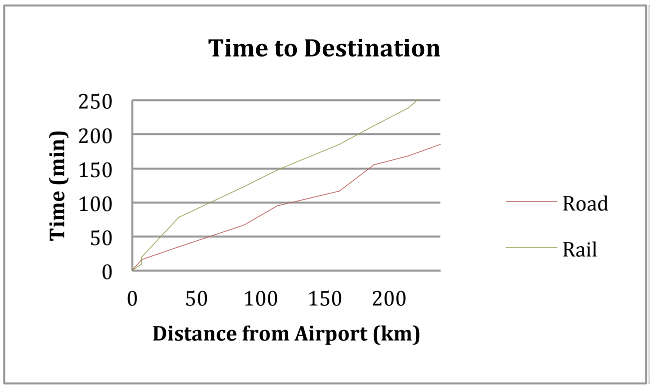


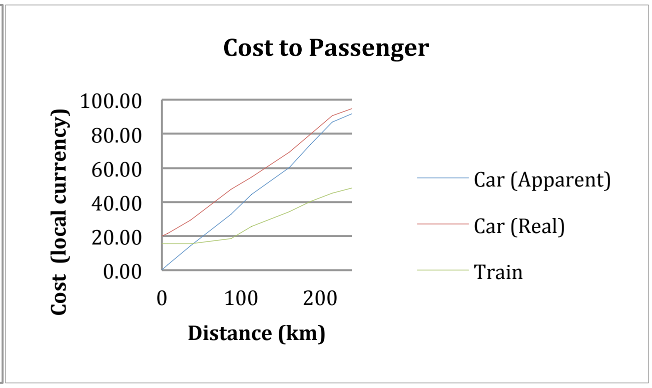


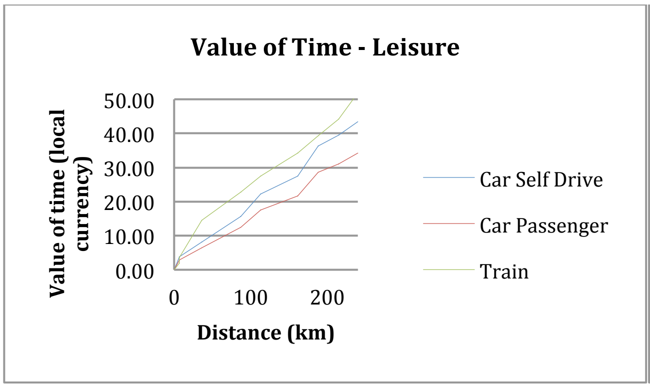


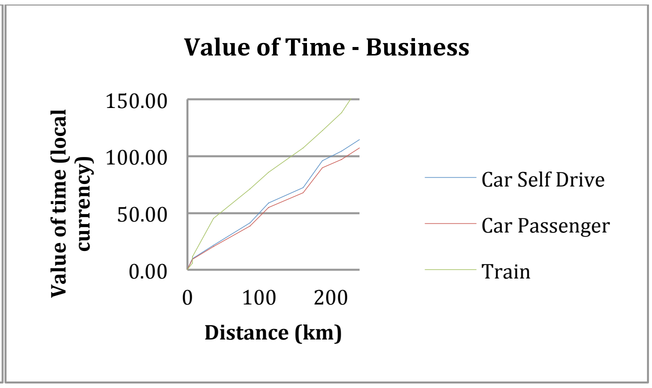
Sydney Airport to Canberra

		Sydney Airport	Central Station	Change Trains	Campbell-town	Bundanoon	Goulburn	Tarago	Bungendore	Canberra
Distance (km)	Road	0	9.9	9.9	44	135	182	223	263	278
	Rail	0	8.4	8.4	54	155	217	254	286	321
	Radial	0	7	7	36	113	161	188	215	240
Time (min)	Road	0	16	16	35	95	117	155	168	185
	Rail	0	10	20	78	148	185	212	239	280
Cost ($)	Car (Apparent)	0.00	3.27	3.27	14.52	44.55	60.06	73.59	86.79	91.74
	Car (Real)	20.00	21.50	21.50	29.50	54.50	69.10	79.82	90.74	94.83
	Train	15.40	15.40	15.40	15.40	25.48	34.30	40.18	45.08	48.02
VOT Leisure ($)	Car Self Drive	0.00	3.75	3.75	8.21	22.29	27.46	36.37	39.42	43.41
	Car Passenger	0.00	2.96	2.96	6.48	17.58	21.65	28.68	31.08	34.23
	Train	0.00	1.85	3.70	14.43	27.38	34.23	39.22	44.22	51.80
VOT Business ($)	Car Self Drive	0.00	9.92	9.92	21.70	58.90	72.54	96.10	104.16	114.70
	Car Passenger	0.00	9.25	9.25	20.23	54.91	67.63	89.59	97.10	106.93
	Train	0.00	5.78	11.56	45.08	85.54	106.93	122.54	138.14	161.84



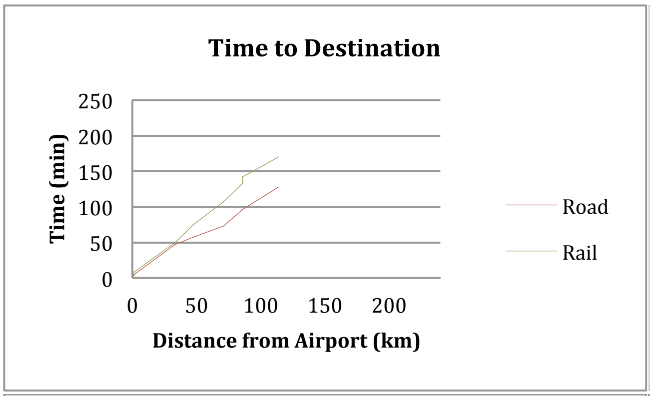


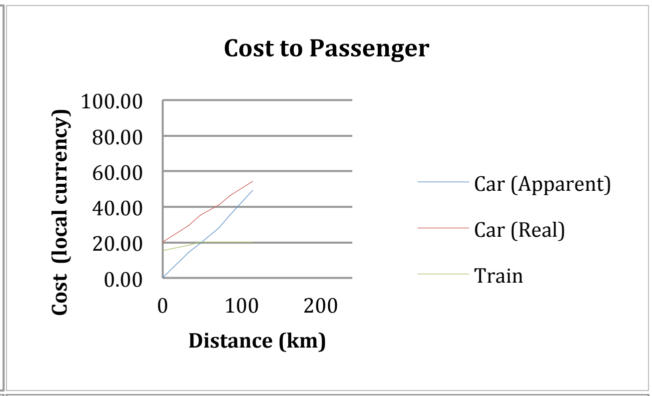


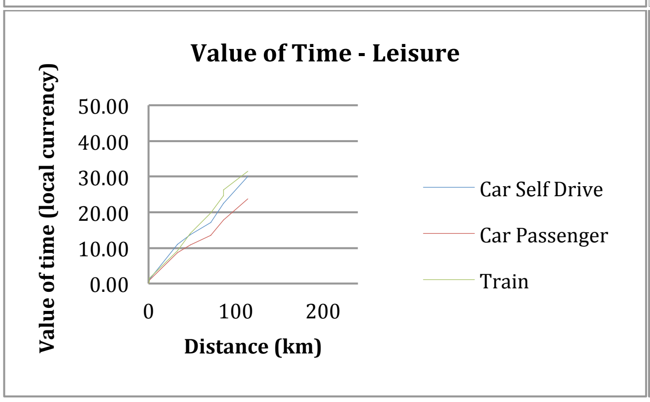


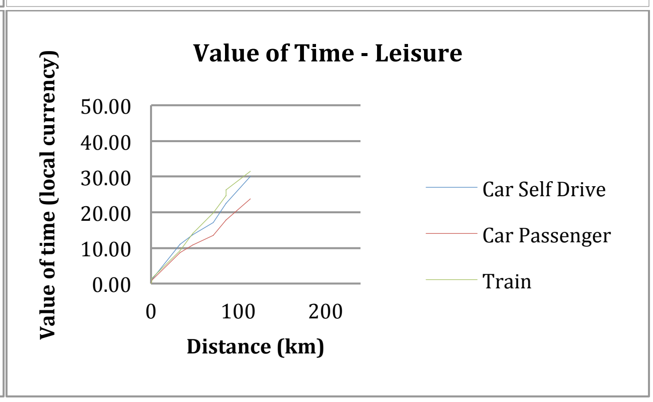
Sydney Airport to Nowra

		Sydney Airport	Wolli Creek	Change Trains	Helensburgh	Thirroul	Dapto	Kiama	Change Trains	Nowra
Distance (km)	Road	0	2.8	2.8	43.6	58.8	85	108	108	149
	Rail	0	1.2	1.2	40	64	89	113	113	147
	Radial	0	1.2	1.2	33	48	71	86	86	114
Time (min)	Road	0	5	5	47	58	73	96	96	128
	Rail	0	4	8	50	76	107	133	142	170
Cost ($)	Car (Apparent)	0.00	0.92	0.92	14.39	19.40	28.05	35.64	35.64	49.17
	Car (Real)	20.00	20.60	20.60	29.60	35.20	40.90	46.50	46.50	54.40
	Train	15.40	15.40	15.40	18.40	20.20	20.20	20.20	20.20	20.20
VOT Leisure ($)	Car Self Drive	0.00	1.17	1.17	11.03	13.61	17.13	22.53	22.53	30.04
	Car Passenger	0.00	0.93	0.93	8.70	10.73	13.51	17.76	17.76	23.68
	Train	0.00	0.74	1.48	9.25	14.06	19.80	24.61	26.27	31.45
VOT Business ($)	Car Self Drive	0.00	3.10	3.10	29.14	35.96	45.26	59.52	59.52	79.36
	Car Passenger	0.00	2.89	2.89	27.17	33.52	42.19	55.49	55.49	73.98
	Train	0.00	2.31	4.62	28.90	43.93	61.85	76.87	82.08	98.26



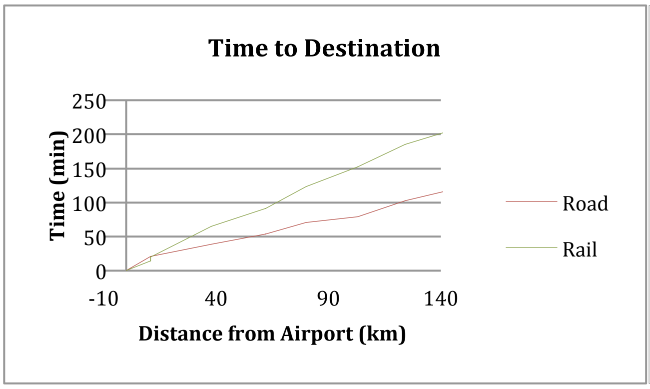


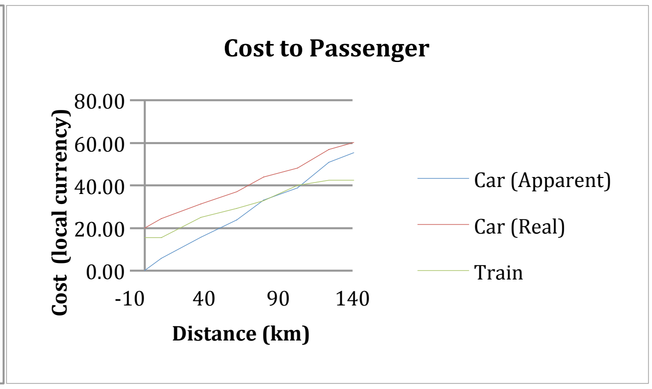


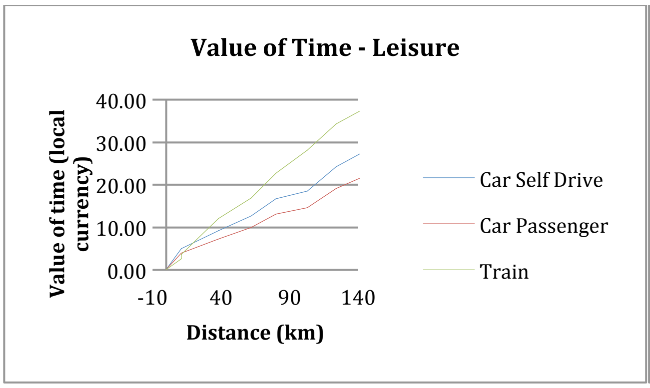


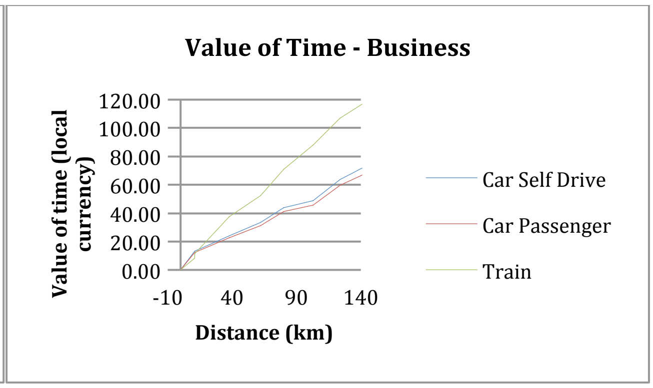
Brisbane Airport to Gympie

		Brisbane Intl	Central Station	Change Trains	Caboolture	Beerwah	Palmwoods	Eumundi	Traverston	Gympie
Distance (km)	Road	0	18	18	48	72	100	118	154	168
	Rail	0	14	14	49.6	76.9	97.3	122.5	150.3	172.2
	Radial	0	11	11	38	62	80	103	124	141
Time (min)	Road	0	21	21	39	54	71	79	103	116
	Rail	0	14	20	65	91	123	152	185	202
Cost ($)	Car (Apparent)	0.00	5.94	5.94	15.84	23.76	33.00	38.94	50.82	55.44
	Car (Real)	20.00	24.29	24.29	31.45	37.18	43.86	48.15	56.74	60.08
	Train	15.50	15.50	15.50	25.10	29.20	32.80	39.90	42.40	42.40
VOT Leisure ($)	Car Self Drive	0.00	4.93	4.93	9.15	12.67	16.66	18.54	24.17	27.22
	Car Passenger	0.00	3.89	3.89	7.22	9.99	13.14	14.62	19.06	21.46
	Train	0.00	2.59	3.70	12.03	16.84	22.76	28.12	34.23	37.37
VOT Business ($)	Car Self Drive	0.00	13.02	13.02	24.18	33.48	44.02	48.98	63.86	71.92
	Car Passenger	0.00	12.14	12.14	22.54	31.21	41.04	45.66	59.53	67.05
	Train	0.00	8.09	11.56	37.57	52.60	71.09	87.86	106.93	116.76









Brisbane Airport to Varsity Lakes (Gold Coast)

		Brisbane Intl	Central Station	South Brisbane	Southbank	Beenleigh	Nerang	Varsity Lakes
Distance (km)	Road	0	18	18	19	43	79	98
	Rail	0	14	16.6	17.5	54	90	103
	Radial	0	11	12	12	36	70	82
Time (min)	Road	0	21	23	24	34	56	79
	Rail	0	19	27	28	64	87	97
Cost ($)	Car (Apparent)	0.00	5.94	5.94	6.27	14.19	26.07	32.34
	Car (Real)	20.00	24.29	24.29	24.53	30.26	38.85	43.38
	Train	15.50	15.50	15.50	20.00	25.10	30.30	34.20
VOT Leisure ($)	Car Self Drive	0.00	4.93	5.40	5.63	7.98	13.14	18.54
	Car Passenger	0.00	3.89	4.26	4.44	6.29	10.36	14.62
	Train	0.00	3.52	5.00	5.18	11.84	16.10	17.95
VOT Business ($)	Car Self Drive	0.00	13.02	14.26	14.88	21.08	34.72	48.98
	Car Passenger	0.00	12.14	13.29	13.87	19.65	32.37	45.66
	Train	0.00	10.98	15.61	16.18	36.99	50.29	56.07