CAPITAL GATEWAY

by

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ABSTRACT

This thesis analyses modern transport interchanges in the context of the current Wellington Railway Station, to then ask: How can interior architecture optimise the use function of a concourse within a transport interchange?

As one of the largest transport interchanges in New Zealand, the Wellington Railway Station serves around 40,000 people everyday. Due to the projected population increase of around 50,000 by 2043, this of course will mean a further increase the number of people travelling each day via the railway station.

The design in this thesis calls for a redeveloped ‘transfer hall’ or ‘main concourse’ area that strives to connect with other modes of transport and accommodate the fluctuation of both patronage numbers while also considering how the interior could provoke a positive social interaction from the user, by doing so it is thought that the new interchange becomes a place to visit, rather than just a quick thoroughfare.

The key aim of the thesis is to capture the current architectural expression of the station, to then convert it into a modern interchange.

▲ Figure 0.1 // Wellington Railway Station main concourse during Easter, 21 March 1940

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CHAPTER 1.

INTRODUCTION
LITERATURE REVIEW

INTRODUCTION

This design research thesis proposes the conversion of the Wellington Railway Station into a modern multi-modal transport interchange through improving the experience of transfer. Using interior architectural strategies the research aims to ensure the new design accommodates the needs of all types of users to encourage the use of public transport and become Wellington's 'gateway' to the city.

As writers, such as Brian Edwards believe, "the transport interchange or hub is a place of connection, public presence, and movement, it is an architectural expression of functionalism and movement acted out in

the interweaving patterns of interior space, light, and technology."¹

Today, the need for encouraging the use of more sustainable transport has become a prioritised issue among governments globally. In New Zealand, the Greater Wellington Regional Council reports that the use of public transportation has increased in the last ten years by 14%. With over 40,000 people traveling through the Wellington Railway Station every day, the site offers an opportunity to investigate how the application of interior architectural strategies could improve and promote the use of public transport.

1. Edwards, *Sustainability and Design of Transport Interchanges*, 110

Opportunity for research

This thesis seeks to provide an interior architectural solution to the problem of improving the experience of transfer for the modern day public transport user. This research project creates numerous questions: what defines a ‘positive’ user experience in the multimodal transfer? How can interior architectural alterations of the Wellington Railway Station provoke a greater public interaction for not just transport, but social engagement, so that an interchange is a place rather than just a space? How can the various groups and their diverse needs of travelers be accommodated within the transport interchange?

Research aims and objectives

A transport interchange must facilitate the movements of both passengers and various modes of transport. In this thesis a desire to understand the needs of the modern day transport user, particularly in Wellington, it asks:

- Can interior architecture impact on the subjective feelings of an individual, minimising discomfort in transfer?
- How can the process of travel in public transport; arrival, transfer, and departure be translated into the redevelopment of the interior spaces in the interchange?
- How can interior architecture provide flexibility to the more temporal and changing needs of public transport users?

In relation to these questions, three primary objectives were made:

- To investigate how interior architecture can impact an individual traveler's attitude toward the process of transfer.
- To engage with the current Wellington Railway Station building and incorporate contemporary designs that will remain current with present and future trends of transport.

Research methodology

As this thesis has focused toward the interior of a transport interchange the methodology in which structured the design-led research was broken into the following steps.

1. Identify the key factors affecting the design of the interior of a transport interchange by

conducting a literature review.

2. Analyse four international case studies were chosen to then investigate how the identified factors contribute to existing and new interior architectural practices.
3. Analysis of case studies tested in the Wellington Railway Station, in order to investigate how the station could be altered, to become a modern transport interchange.
4. Evaluation of the first design tests and further developments
5. Resolution of final design

LITERATURE REVIEW

“Interchange - ... where people exchange their culture, language or information for their own development” (Shin Takamatsu, 1994)

Transport in and around city environment has always been an important component of day-to-day life for many people. Architects at Gehl People state that an enriching travel experience goes a long way in making cities friendlier, easier to use and navigate. This literature review critically investigates key design factors affecting the operation and function of transport interchanges. The purpose of the review is to understand the interchange in relation to the interior, and to consider how the application of interior architectural design strategies could improve the transport interchanges’ ability to best serve its role to the user. The review will first look to discuss how a railway station is an interchange and how it holds significance for the redevelopment of modern multi-modal interchanges. The next three sections will consider how key factors such as: access, circulation and programme, all incorporate the use of interior architectural strategies to strengthen the user’s perception of a transport interchange.

Li and Loo argue in their study titled “Towards people centered integrated transport: A case study of Shanghai Hongqiao Comprehensive Transport Hub” that, “a railway station is equal to an interchange, as most rail journeys cannot be completed without an interchange”¹. In the context of Wellington city, the increase in the use of both bus and particularly train has been considerable, with usage expected to rise further in the coming years. As a result, another 50,000 people living in the city could become a catalyst for the Wellington Railway Station to advance the transport hub to connect multiple modes of transport. A ‘modernised’ transport interchange is as Edwards’ describes, “A hybrid that accommodates new transportation technologies and seeks to provide expression for the interconnected nature of modern multicultural and pluralistic life.” Edwards’ is confident that a transport interchange is defined as a transport facility that allows travellers to transfer from one mode to another, as distinct from a conventional single mode station facility with no capacity to interchange with other transport services.

1. “Towards people-centered integrated transport: A case study of Shanghai Hongqiao Comprehensive Transport Hub.”, 5.

2. Edwards, *Sustainability and Design of Transport Interchanges*, 29.

Accessibility

Adams (1981) states that ‘access not movement, is the true aim of transport’. Enoch (2013) identifies that a transport interchange comprises of three key and separate elements: access, interchange and egress. The interchange as the intersecting node between both transport infrastructure and city means its location and collection of nodes becomes more important. Alexander (1977) suggests that any infrastructure, for example, supporting the access and egress of public transport should be secondary to the interchange, which then takes on the primary role. Accessibility of the fixed interchange is highlighted by Edwards (1997), as one of the key factors to measure the performance and success of the interchange.

As this review is concerned in exploring the interior architectural factors of the transport interchange, it is important to acknowledge how in fact do the external factors such as site location and its relationship with its surrounding context, affect the outcome for the interior of the interchange. One point that both Edwards and Blow discuss that will aid in successfully providing

better access within a transport interchange, is that through interior architecture clear connections or visual shafts to the external surroundings of the city help to orientate passengers. Kido explains that visual linkage between the platform and concourse through the articulation of natural light can also increase legibility. An example of this is shown at the Canary Wharf Station, designed by Sir Norman Foster. As a part of the Jubilee Line Extension in the UK, the Canary Wharf is the largest subway station to be built. At ground level, the station is laid out as a landscaped park. The only visible elements of the station are the arcing glass canopies that create three entrances and funnel daylight into the concourse. The use of natural lighting admitted into the station interior helps passengers recognise key entry and exit points, meaning that orientation is enhanced, minimizing the need for directional signage, while also intensifying the architectural impression of the station.

Another key factor affecting access and therefore the users’ perception of transfer within a transport interchange is the location of transport modes in approximation to other modes. Long walking distances can have a negative impact on a user. Alexander (1977) states that the distance between transfer points should be not greater than 100 meters. “...a significant part of easy accessibility is

3. Enoch, “Conceptualising the Transport Interchange”,

▲ Figure 1.02 // Canary Wharf, west entrance interior, showing external visual shafts

good core terminal facilities, well placed.”^(fn) As a part of their research to investigate what factors support a successful multi-modal interchange, Li and Loo conclude from survey data that although walking distances between transport within an interchange may not be altered due to ‘fixity of the infrastructure’, facilities such as moving walkways, lifts, and escalators are needed to ensure a safe and smooth journey for passengers. While this strategy does look to improve accessibility within an interchange, Edwards argues that the best way to improve accessibility through interior architecture is to centralise transport facilities within an interchange. Otherwise, implementing design solutions such as ‘access ribbons’ to integrate a transport interchange with its surrounding environments. By doing so the interchange acts solely as a bridge between transport infrastructure and the surrounding urban environment. A built example of this is the new Southern Cross Station in Melbourne. Designed by Grimshaw in partnership with Arup, the interchange was a redevelopment of the formerly known Spencer Street Station. The main aspects of the new transport interchange were practical performance, ease of passenger circulation and an improved working environment for staff. The station interior is a ‘vast hall’ with uninterrupted vistas in every

direction so that the interconnection of different streets surrounding the building can be easily understood and access to transport is maximised, as the trains are visible from the city. As a way to better accommodate a range of different modes of transport, the Southern Cross Station interchange centralised transport and placed other programme functions away from direct points of access. Therefore putting transport at the forefront of the interchange and displaying other transport facilities and public recreation spaces.

Circulation

The ability to orient and navigate through places is a fundamental human requirement, and in the context of the interchange circulation as the process of arrival, transfer and egress must be enabled and communicated as efficiently as possible for the individual user.¹ Transport interchanges while often being a source of civic pride and focus, can equally become illegible to an individual and a source of anxiety and stress. The primary focus of circulation in transport architecture resides through two key components as the type and frequency of use and the direction of movement Edwards 1997. Therefore, spaces involved in transferring passengers between

4. Alexander, *A Pattern Language – Towns, Buildings, Construction*, 170.

5. “Southern Cross Station, Melbourne, Victoria.” Verdict Designbuild. n.p

different types of transport must follow a hierarchy of spaces all appropriately to scale while also remaining legible for all users.²

“Interchanges work as a machine and the role of space is to lubricate the movement of people between the different nodes of transport. In this sense, space is for people.”³

Kido (2006) states that the careful planning and range of scale within the interchange needs to, reflect not only the capacity for the number of passengers using the hub but also encompass the overall impression of the interchange. For example, huge transport terminals in Europe, such as St Pancras Station and Paddington Station in London, were designed to, not only provide passengers with suitable space but also give a good impression. These grandiose stations, which resemble Gothic-style cathedrals, have had various political meanings over their lives. In comparison, smaller scaled hubs have been designed based upon a more human scale, with lighting which helps to make space seem wider.⁴ Following on from scale, Edwards’ discusses that due to their role today, the transport interchange is the extent of gathering and movement space. “In the interchange, the proportion of movement and dwell space is

greater than in singular transport provision.”⁵ That the orders in which different spaces within an interchange are placed have a significant impact on the success of clarity. There is a need within the interchange to supply a combination of simplicity and complexity within. It needs to provide simplicity most of all, as it is through simplicity that the interchange becomes legible to the traveler. Therefore, there needs to be a clear hierarchy of spaces that provide a clear progression and flow of space from interior to transport. Based on his extensive portfolio of work in designing better transport architecture, Edwards’ lists that there is key spatial pattern of a typical interchange, and they are:

- a sizeable enclosed ticketing and information area;
- an open external area for inter-modal connection;
- an internal concourse for inter-modal connection and waiting;
- a linear platform, pier or gate for boarding;
- a bridge or tunnel for crossing transport infrastructure.

“If these are treated architecturally in different ways using structure as the defining characteristic, users will be better

6. Griffin, *Building Type Basics for Transit Facilities*, 45.

7. Kido, “Railway Landscape Design and Relationship with Form, Function and Aesthetic”, 30.

8. Edwards, *Sustainability and Design of Transport Interchanges*, 150.

9. Kido, “Railway Landscape Design and Relationship with Form, Function and Aesthetic”, 23.

10. Edwards, *Sustainability and Design of Transport Interchanges*, 112.

able to navigate their way through complex interchanges.” (Edwards 140) In addition to these, Edwards’ also claims that a combination of architectural structure and the use of sufficient natural and artificial light can strengthen both spatial perception and route legibility. “Bathing the primary structural members in daylight helps signal their importance and is particularly helpful for people with visual impairment.”¹¹ However, it is vital that sunlight is controlled in order to prevent glare, particularly around staircases and where columns stand within major routes through the interchange. “As a general rule, major structural members should signal the significant movement corridors and concourse spaces with daylight reinforcing the message.”¹²

Programme function

The ‘phenomenon’ of the modern day multi-modal interchange has seen the value in providing more in transfer for the user. This section of the review examines new functions of programmes involved in the design of the contemporary interchange; it compares the role of both public space and commercial activity to

address why each has value to the function of the transport interchange.¹³

The inclusion of public space in the transport interchange remains a contentious topic among developers and designers alike, as the fundamental goal of public transport buildings is to process passengers between different types of mobility efficiently. As Edwards’ discusses, the role of public space within transport may challenge traditional practices of transport architecture. Lynch is of the view that to maximize the image qualities of the interchange; public space is important to increase the level of economic or social interaction.¹⁴ A ‘node,’ or in this case a building such as the transport interchange is only able to be imagined when there is engagement between space, people and activities. The more the interaction, particularly socially, the more the interchange becomes memorable. Lynch also adds that the problem with interchanges is that they are too functional, too machine-like in their rational planning, and too dominated by commerce. A transport node is foremost for people. Writers, such as Rogers (1986) write that the interchange, like any other public building, needs to be seen as an opportunity to accommodate social

11. Edwards, *Sustainability and Design of Transport Interchanges*, 140

12. Edwards, *Sustainability and Design of Transport Interchanges*, 141

13. Lynch, *The Image of the City*, 23

inclusion and activity, because the users of the interchange are not only attracted to fast, efficient transport but are equally drawn in by the "attractiveness, vibrancy and safety of the surrounding public areas" ¹⁴

Accommodating the needs of the modern traveller today means traditional methods of approach in the function of the transport interchange must be met. As Kido (2006) states, commercial spaces within a transport terminal such as a railway station has a definite role in the promotion of transfer of passengers. The traditional model 'station' has the principal transport functions, such as restaurants and hotels. But in their development, railway interchanges have come to perform many other functions for users to the point where commercial functions are outweighing the transport/ transfer and instead are becoming more like malls. Aligning the needs of retailers is often at the heart of interchange design.¹⁵ Commerce is an important source of income and many large stations operate as supermarkets for their local community. Achieving alignment between retail and transport interests can be difficult, especially as the scale and complexity of commerce at interchanges increase over

time. Rather than fill the concourse spaces with shops, bars and market stalls, it is better to design the retail areas at the outset. ¹⁶ To maximise the image qualities of the interchange it is important, Lynch says, "to increase the level of economic or social interaction. A node is only imageable when there is engagement between space, people and activities. The more the interaction, particularly socially, the more the interchange becomes memorable."

The main task of the interchange is to provide efficient and pleasant connections for those travelling, while the retailer wants to slow down movement in order to get people to purchase goods of various kinds. Clarity of wayfinding needs to come before commerce if the interchange is to attract users of all ages and income brackets.. But as Edwards' discusses, "Rather than fill the concourse spaces with shops, bars and market stalls, it is better to design the retail areas at the outset, using management agreements to curtail the colonisation of travel or waiting areas."¹⁷ In order to resolve tension between the commercial/ retail and key transfer areas, Edwards and Lynch discuss that the two must be separated, creating a hierarchy the main transfers areas must be prioritised

14. Rogers, *Cities For A Small Planet*, 145

15. Edwards, *Sustainability and Design of Transport Interchanges*, 152

16. Edwards, *Sustainability and Design of Transport Interchanges*, 156

17. Lynch, *The Image of the City*, 25

18. Edwards, *Sustainability and Design of Transport Interchanges*, 158

▲ Figure 1.04 // Berlin Central Station, an intersection of commercialism and transport

first before commercial/ retail - only when this is implemented travel efficiency will be maximised.

In conclusion, in order to be successful the contemporary transport interchange must be an integrated place of connection, of transfer, and of social interaction. As writers like Griffin's discuss, that the interchange is a balance of architecture and infrastructure cannot be greatly changed, the design and execution of the spaces for transfer need to be carefully considered - to ensure that not only is efficiency achieved but a high-quality experience for the user. According to Edwards', "unless transport interchanges provide clarity of use and raise the spirit, they will not be able to achieve the switch from car use to public transport, no matter how well designed the new trains or buses may be." ¹⁹ This literature review has examined the critical design factors affecting transport interchanges, while also offering interior architectural strategies that in the writers

deem effective in resolving these issues. The next stage of thesis will be used to explore and test these approaches by selecting four international case studies.

19. Edwards, *Sustainability and Design of Transport Interchanges*, 21

CHAPTER

CASE STUDY ANALYSIS

2.

1. KINGS CROSS STATION
LONDON, UNITED KINGDOM

2. FLINDERS STREET STATION
MELBOURNE, AUSTRALIA

3. ARNHEM CENTRAAL STATION
ARNHEM, NETHERLANDS

4. FULTON STREET TRANSIT CENTER
NEW YORK, UNITED STATES OF AMERICA

INTRODUCTION

The following section analyses four international case studies that illustrate how interior architectural methods improve multi-modal transfer through an interchange. The interchanges selected were: Kings Cross Station, Flinders Street Station, Arnhem Centraal and finally the Fulton Street Transit Center. Varying in location, size and visitor numbers, the case studies were selected as they all highlighted an attempt to solve issues discussed in the literature review.

KINGS CROSS STATION

LONDON, UNITED KINGDOM

Kings Cross station has brought travellers and goods to and from the capital for more than 150 years. After the completion of the original station the feeling of order ‘frayed’, as the Kings Cross area became one of London’s apparently intractable socio urban messes, a poorly coordinated series of road traffic and trains, along with grumpy commuters - meant the stations perception by user’s was weak. A series of temporary extensions on the Kings Cross meant that were segregated elements which created a disjointed journey for the user who had to travel back and forth between the east and west wing sheds.

The key aim set out by the designers John McAslan + Partners and engineers Arup was to transform the existing complex infrastructure into a transport hub, rather than the series of obstacles it used to present. The transformation of the station into a ‘transport hub’ for the connection between modes such as the underground railway and over rail along with regional and local bus transport, the overall design scheme fuses

together three distinctive interior architectural methods of: reuse, restoration and new build. The train shed and range buildings have been adapted and re-used, the station’s previously obscured Grade I listed facade was restored, and a new expressive Western Concourse was designed at the heart of the station. The intention of the Western Concourse was to connect travellers with new entrances to the station while also providing them with amenities, such as hospitality and commercial areas.

The semi-circular concourse rises 20 metres and spans the 150 - length of the existing Grade I Listed Western Range, creating a new entrance to the station through the south end of structure and at mezzanine level to the northern end of the Western Concourse. The design of the Western Concourse demonstrates how interior architecture was used to incorporate the existing heritage with modern attributes to provide passengers with accommodating transfer areas that offered a reflection of the station’s history from the existing station shed buildings. By implementing new public space and retail businesses, the redevelopment shows that 20% of visitors are not there for travel, but because of the station amenity.¹

1. Ray, D. King’s Cross Station by John McAslan. n.p.

▲ Figures 2.01-2.03 // Interior images of the new Kings Cross Western Concourse

FLOOR PLAN

The purpose of this diagram above was to illustrate the main transfer floor of the Kings Cross, showing the key areas of pedestrian access in accordance to the other modes of public transport surrounding the interchange. The drawing shows that there are two main types of transport the interchange supports; local bus and trains.

A. Passengers transfer on ground floor level to either depart Kings Cross or to use the London Underground.

B. Remaining level with the main railway station platforms the central concourse aligns well to provide a clear pathway for passengers. Escalators help to transfer passengers between the underground subway and railway stations.

C. There are four key pedestrian access points at the new Kings Cross Western Concourse.

▲ Figure 2.05 // Diagrams to show how the case study incorporates programme function, circulation and accessibility

FLINDERS STREET STATION

Melbourne, Australia

Located on the corner of Flinders and Swanston Street in Melbourne, Australia. The Flinders railway station serves a part of the metropolitan rail network, and is a prominent part of the city's fabric. As a part of Melbourne's desire to redevelop the historic landmark it inspired a design competition in which many local and international practices presented proposals. In 2013, HASSELL and Herzog de Meuron won the competition to design the redevelopment.

One of the key issues in the current state of the Flinders Street station were the 'pinch points' in accessibility, such as the subways and waiting areas of the platforms. The linear form of the existing Flinders Street Station building was determined by the original layout of the tracks - which, creates a separation between the city, the railway and the river. Along with accessibility, competition criteria asked that the design had to portray a strong reflection upon the heritage elements of the existing station while ordering civic connection with the surrounding city.

The winning proposal aimed to solve these issues by their overall incorporation of public access to site and to add public programme activities in the form of galleries and a civic plaza area. The main entrance of the new design was elevated in order to provide better circulation for both train and passenger access. Identifying the intentions from original plans for the station in 1899 for a generous arched roof with three large vaults. The design used tracings of the arches and vaults in shape and scale from the existing heritage building to then define the main element for the architectural expression of the new roof. Defining the users' journey, each vault precisely follows the movement and sits directly above each train and the passengers on the platform. The actual construction of the roof is reinvention of the historic vaulted roofs of classic train stations.¹ Woven structural bands create and articulated filigree roof that provides weather protected environment, dispersing natural light and ambience throughout the entire station. The design outcome of this case study demonstrates how interior architecture was used to better accommodate fluctuating passenger flows while also developing a building language that distinguished different journeys through.

1. "The Flinders Street Station Winning Proposal / HASSELL + Herzog & De Meuron." n.p

▲ Figure 2.06- 2.08 // Images of HASSEL and De Meuron's winning design proposal of the Flinders Street Station redevelopment

FLOOR PLAN

The purpose of this diagram above was to illustrate the main transfer floor of the Flinders Street Station Design Proposal, showing the key areas of pedestrian access in accordance to the other modes of public transport surrounding the interchange. Shown in the drawing, there are three key types of public transport facilitated with and by the new Flinders Street Station Interchange.

▲ Figure 2.09 // Diagram to show how the case study aligns to other modes of transport

A. Large transfer area within the interchange design helps to allow for other passenger amenities, in this project a push for public space was prioritised closely with the function of transport infrastructure.

B. As the station platform access and the direct train routes are split, it means that there is a better allowance for the pedestrian movement within the interchange.

C. There are seven key pedestrian points of access to the site.

▲ Figure 2.10 // Diagrams to show how the case study incorporates programme function, circulation and accessibility

ARNHEM CENTRAAL

Arnhem, Netherlands

As a part of an ambitious 20 year long redevelopment project, Arnhem Centraal is a transport interchange that aimed at being a gateway or ‘front door’ of the city, embracing the spirit of travel, and to also establish Arnhem as an important node between neighbouring countries like Germany and Belgium.

The key aim for the designers from UNStudio was to find away to incorporate the different types of public transport (bus, train and car share) all located in the vicinity of the existing Arnhem Station, and provide a seamless transfer for the user. After intensively researching passenger flows and transportation nodes, UNStudio proposed that the new terminal should expand to become a “transfer machine” that in turn incorporates the whole spectrum of public transport. The 21,750m² ‘transfer hall’ took on the architectural expression for the intended movement of passengers. Taking

references from the continuous inside/ outside reference from the Klein Bottle, UNStudio aimed to blur distinctions between the inside and outside of the terminal by continuing the urban landscape into the interior of the transfer hall, where ceilings, walls and floors all seamlessly transition into one another.

“Arnhem Central is no longer just a train station. It has become a transfer hub. We wanted to give a new and vital impetus to station design, so rather than merely designing the station around the activities and people flows that already took place there, the expanded architecture of the new Transfer Terminal directs and determines how people use and move around the building.”¹

Through interior architecture, the design of the main transfer hall within Arnhem Centraal demonstrates how the physical movements of passengers was used to influence the overall interior formwork and in turn develop the building’s own wayfinding system, where instead of relying solely upon signage. The twisting form of the design orientates itself towards the three key modes of transport support by the interchange.

1. “Arnhem Central Transfer Terminal / UNStudio.” ArchDaily

▲ Figure 2.11-2.13 // Interior images of the Arnhem Centraal Station

FLOOR PLAN

The purpose of this diagram above was to illustrate the main transfer floor of the Arnhem Centraal Station. The drawing shows that the interchange is used by three main types of public transport; regional buses, local bus and the Arnhem railway.

A. The new transfer hall helps to interconnect multiple modes of transport with an array of retail, office and public space. Offices located in the main transfer floor (illustrated in programme function diagram) do not obstruct the passengers transferring through the interior of the interchange.

B. The implementation of a central twisting ramp and staircase enables efficient movement through the whole transfer hall and connecting transport platforms.

C. There are four key pedestrian access points to the site. The regional bus entry is street level with the transfer hall provides a more seamless movement into the interchange.

▲ Figure 2.15 // Diagrams to show how the case study incorporates programme function, circulation and accessibility

FULTON STREET TRANSIT CENTER

NEW YORK, UNITED STATES OF AMERICA

Situated in the heart of Manhattan, New York, the Fulton Street Transit Center was designed by Grimshaw Architects, the purpose of the project was to redevelop the centralised transit area, streamlining connectivity between nine MTA New York City Transit subway lines (2, 3, 4, 5, A, C, J, Z and R) while enhancing the user experience for 300,000 daily transit passengers.

One of the hardest issues to solve for the project was that there was a lack of natural light. In order to resolve issues in lighting throughout the interior of the transit center, the design of a large skylight or other wise known as the ‘oculus’, was placed in the center of the building. Roughly the same size as the Guggenheim spiral, the “sky reflector net” is used to capture daylight and funnel it two storeys below ground, which proves valuable for the building’s connection to the underground subway. The overall form and layout of the ‘oculus’ is also reflected in the

Acting as a central piece for activity and movement through the transit center, the ticket office and main concourse contain cafes and shops as a way to ‘display’ these amenities to the users moving through and possibly entice them to engage. This inclusion means the transit center in turn does not just solely operate as a station, but also as a place where people can visit and not use transport.

A use of high quality materials and generous circulation spaces were among the interior architectural techniques that were used well to provide an efficient transport interchange. Although the design concept is simple – a semi transparent cone set within a cube of glass that in turn recalls the play of sculptural forms in the work of Le Corbusier. Everything is visible to the user, including the routes down to six underground stations and, in the opposite direction, the streets outside.

▲ Figure 2.16- 2.18 // Interior images of the Fulton Street Transit Center, New York

FLOOR PLAN

The purpose of this diagram above was to illustrate the main transfer floor of the Fulton Street Transit Center. As a traveller moves down from street level to four levels below, the display of shops on three floors of the transit center, but they do not obstruct direct passenger movements. A passenger can access the interchange by the underground subway, John Street and Fulton Street.

A. The new transfer hall helps to interconnect multiple modes of transport with an array of retail, office and public space. Offices located in the main transfer floor (illustrated in programme function diagram) do not obstruct the passengers transferring through the interior of the interchange.

B. Following a circular form, multiple staircases and escalators are located in the center of the atrium and allows light to filter all the way down into the subway stations.

C. There are three key pedestrian access points, two of them coming from the underground subway, and the other from John Street four storeys above.

▲ Figure 2.20 // Diagrams to show how the case study incorporates programme function, circulation and accessibility

CONCLUSION

summary of findings

These case studies examined ways in which interior architecture of the interchange could be resolved to influence the transfer between multiple modes of transport positively. One of the most significant discoveries through the case studies was that the inclusion of a 'transfer hall' or 'concourse' held considerable influence over the success of a transport interchange. This is because of its ability to be adapted by designers to both accommodate and ease passenger congestion while also offering a place for social interaction.

In relation to the Wellington Railway Station, each of the case studies offered design strategies that could be applied to strengthen the development of interior architectural strategies for a redesign of the site. Opportunity to offer more to the user in its main concourse, as it does not fully optimise the public areas of transfer areas.

1. Kings Cross Station; the new Western Concourse incorporated the pre-existing station buildings and then used the sweeping

form of the central 'branch' to define a hub within a hub

2. Flinders Street Station; In relation to the Wellington Railway Station, the use of linear form to guide passengers through, this is a strategy that could be developed to enable a more clear journey of transfer for passengers. The redesign used large vaults on street level to open and invite passengers into the new interchange.

3. Arnhem Centraal; movement through transfer was the inspiration of the twisting curvature of new transfer hall form - as it provides its own wayfinding system for passengers. The transfer hall used multiple skylights to flood daylight into deeper parts of the interchange.

4. Fulton Street Transit Center; the use of the 'sky reflector net' was successful in this case study as it funneled much needed daylight into main areas of the interchange. In relation to the Wellington Railway Station, the articulation of natural light could be tested to maximise clarity and comfort for users.

CHAPTER

SITE ANALYSIS
USER DATA ANALYSIS

3.

INTRODUCTION

Site Analysis

This section will analyse the site of the proposed new transport interchange and explain the rationale behind why it was chosen. The study will then discuss the qualities of the site, specifically on the interior spaces of the public areas of the railway station, while also making reference to the future of travel at the Wellington Railway Station.

The specific aim of the site analysis is to analyse the areas where the current site performs successfully as a transport interchange, but most importantly to highlight areas in which lack in providing an efficient multi-modal transfer and in turn fail the user. The design component of this thesis investigates how the

reconsideration of the interior environments within an existing transport interchange can provide a better experience for the modern day public transport user.

“... the building is a dignified and largely undated structure, the architecture of which is impressive.”

The Wellington Railway Station was chosen as the site for this research portfolio as it encompassed a great potential for a redevelopment of an interchange, originally built as a sole railway station it now serves and interconnects with multiple modes of transport –local and regional bus terminal, car share, blue bridge ferry terminal and taxi stands.

SITE ANALYSIS

Wellington Railway Station

[Background] Opened in 1937, the Wellington Railway Station stands as an example of a Beaux-Arts style of architecture. Remaining to be a central part of public transport in the city, the erection of the station was apart of redevelopment by the government – to integrate a better railway station connection for users. Comprising 250 rooms and 1.2km of corridors, the large station was built to accommodate the 675 staff from both the railway's department head office while also replacing Wellington's two former stations, Lambton and Thorndon.

Today, the Wellington Railway Station still serves as one of the largest transport terminals in New Zealand. Connected via a subway the railway station neighbours the main Wellington bus depot, together bringing around 40,000 through the railway station site everyday. Among that number are also the office workers and students who work in the upper levels of the station.

▲ Figure 3.02 // Exterior perspective of the Wellington Railway Station

▲ Figure 3.03-3.06 // Interior images of the current Wellington Railway Station

[Points of interest] Remaining mostly true to its original construction, the Wellington Railway Station has “worn well”¹ as over its life has not needed any critical alterations. Many of the large passenger areas, like the ‘booking hall’ and ‘concourse’ have remained in their original state. Pictured on the left are four interior shots of the current station, the photos work as a journey through the interior for a passenger. As this thesis focuses on understanding how interior architectural strategies could assist in converting the Wellington Railway Station towards a modern transport interchange, this interior analysis will be used to highlight and examine critical features that positively or negatively aid passengers in a transfer.

①. *Main entrance // doric columns*

The 13 metre high doric columns help to emphasise entry into the station. Meeting the vehicle drop off area, the Bunny Street entrance to the station is obvious to visitors. Insufficient light from the interior of the transfer hall makes it harder to see through to the concourse and platform areas.

②. *Booking hall // vault ceiling*

The interior of the station holds a large vaulted ceiling that greets passengers upon arrival from the Bunny Street entrance. Ticket offices/ booths that were almost ‘cutout’ from the walls of the ‘booking hall’ are vacant

③. *Concourse // Low arching skylight roof*

Framed by multiple arches made of reinforced concrete, the glass roof allows daylight to filter directly into the main concourse area. While this works well for the concourse area, daylight is not sufficiently continued throughout the whole station area as areas such as the gates to platforms and the ‘Trax cafe’ area do not share the same amount of light.

④. *Platforms // partial shelter coverage*

Platform shelters cover the direct pedestrian routes, but do not ‘house’ the trains and all of the platform area. Non-transparent the platform shelters do not allow daylight on to the train station platforms.

1. “Wellington Railway Station.” IPENZ Engineers New Zealand.

“The long term approach is to provide a modern, effective and efficient integrated public transport that contributes to sustainable economic growth and increased productivity while also providing for the social needs of the community.”¹

According to the ‘Wellington Regional Land Transport 2015’ report, the Wellington region has a quality, well used public transport network of bus, train and harbour ferry services. Over 80% of the regions population live within 500 metres of a bus stop, the Wellington Railway Station aligns closely with both public and private modes of transport. The regional bus station sits on the eastern side of the station, while the main Wellington City bus terminal is located to the West, via the underground subway.

The drawing on the right illustrates the number of pedestrian access points to the current site, and its relationship with other modes of transport. One of the strongest points of access is the Bunny Street entrance

to the station as it allows both vehicle and pedestrian access to the site. However, the mix of these methods of access to site can cause some congestion outside of the station. As seen on countless visits to site a line of cars would build up having to wait for stream of pedestrians crossing into the station.

1. Greater Wellington Regional Council. Analysis of the Rail Survey Data. 2011

▲ Figure 3.07 // Site in relation to other modes of transport and pedestrian access points

There are eight public amenities available on the ground floor of the Wellington Railway Station. The most successful is the New World Metro supermarket, where in peak and off-peak hours the place is humming with activity of passengers and other visitors to the station.

Seen in the diagram above, the supermarket wraps around from the 'transfer hall' to the eastern corner of the main concourse area. Two of the three entrances to New World located in the transfer hall sit alongside to the 'Gravity Coffee Stand', which works well to grab supermarket customers for a quick coffee fix.

▲ Figure 3.09 // existing ground floor plan of the Wellington Railway Station

USER DATA ANALYSIS

Wellington Railway Station users

As the site analysis aimed at understanding not only the overall physical aspects of the Wellington Railway Station but also the types of users in it, this next section examines the four main types of commuters. The information was taken from the GWRC 2015 public transport report.

In the last 10 years public transport has grown by 14%, and with the number of Wellington residents who take the car into the city decreasing by a further 3% in 2013, Wellington City Council has outlined as a part of their 2015 Urban Growth Plan, that more focus will be applied to the maintenance

and development of public transport infrastructure - to align with supporting more sustainable transport in Wellington.

Taken from a set of cordon data, recorded by the GWRC, the spreadsheets show how many people entered and exited the Wellington Railway Station in the peak hours of travel (7-9 and 4-6). The data recorded that the total number of people visiting the station in the peak hours was 15,700 (am) and around 14,000 (pm).

▲ Figure 3.10 // Wellington Railway Station user information profile

CONCLUSION

site analysis

The site analysis has examined the role and function of the current Wellington Railway Station. Constructed in 1937, the site has continued to be a beacon of public transport in Wellington, with around 40,000 visiting each day, and with that number set to rise due to another 50,000 living in the city over the next 25 years. This analysis found that in order to support the current and future trends of travel, the Wellington Railway Station needs to be re-adapted towards a modern transport interchange, this means that some aspects of the current interior fail to enhance a user's experience in transfer. The interior architectural design strategies demonstrated

in the international case studies could be explored and tested to strengthen this redesign. One of the critical issues found in the site analysis was that although the Wellington Railway Station has a significant number of people visiting each day (40,000 as already stated), the site does not offer enough in terms of public amenities in the main concourse area.

CHAPTER

DESIGN DEVELOPMENT
REFLECTION
FINAL DESIGN

4.

INTRODUCTION

This chapter presents the redesign of the Wellington Railway Station drawing on the work from proceeding chapters. As the focus of this thesis is to investigate interior architectural strategies that could improve the function of an existing transport interchange, the first stage of this section will show how both observation and sketch studies helped to redevelop key transfer areas within the station. The second stage will show how physical modeling was used to redesign the interior of the interchange.

DESIGN DEVELOPMENT

Observation study

This study used the method of observation refined by William H. Whyte in his book *The Social Life of Small Urban Spaces*, used to describe human behaviour in dense urban environments. Adapting my own study to the topic of the thesis meant I was looking at patterns in people's movements in transfer and stay in a transport interchange.

As a way to start the first stage of design, observing the people who used the site at different times was an important part of understanding areas in which interior architectural strategies (highlighted through the literature review) could be explored to resolve issues in the current internal environments of the station. The noted behaviour made by people in the station were grouped and tallied, this ensured each was not just random or one-off. In this study, I was interested in noting four key areas of the station: traveller's mapped movements and their actions towards the design and organisation the interior spaces. Visiting the

site five times in the peak and off peak hours of the day it became apparent that there were some common occurrences in the behaviour and actions of people moving within the station. Before the observation study was completed, test study factors were defined, so that each test was regulated, they were as listed:

1. Time of Day
2. Single Person or Group of People
3. Male or Female
4. Age Range

Each of the observation studies ran for the same amount of time: 30mins as this meant that two groups of arriving and departing train passengers could be studied. Accompanying each noted instance, sketching movements and features of the interior was a key part of this section. Note that the images were taken to capture points of interest, so may not have been taken on the same day.

▲ Figure 4.01 // Location of four observation recordings, Wellington Railway Station

- Top view of how people in the observation stand and move in the ticket office line.
- The movable 'bollards' help to define an order of people waiting.

- Section cut showing how the ticket offices at the bottom of concourse archways.
- Change in ceiling height from concourse in the ticket offices/ admin.

- Floor plan showing toilets and ticket office location. Both sit flush with the walls of the concourse.

- Perspective sketch showing light and shadow hatching in the concourse area. The arched skylight filters down to the ticket office area.
- The large beams running the length of the concourse cast shadows into the space.

1. TICKET PURCHASE

waiting congestion

		no. of times
instance	A. People standing inline with the ticket bollards	20+
	B. People who were obstructed by ticket lines when walking to platforms or out of the concourse	16

- Floor plan sketch of how people travel through the transfer hall. There are three key points of interest where people are most likely to stop for: New World Metro, coffee cart and the bag and show repair shop.
- External windows and artificial lighting do not emit enough light in the darker times of the day.

- Perspective sketch showing light and shadow hatching in the transfer hall.
- Shading appears around the corners of the 'ticket hall' and means standing areas are darker

2. TRANSFER HALL

lines of movement through

instance	no. of times	
	A.	B.
A.	Person stationary waiting out of the way from others	7
B.	People who walked straight into main concourse	50+

▲ Figure 4.03 // Observation location two image and drawings, Wellington Railway Station

- Floor plan drawing, people seek shelter from other incoming and outgoing passengers standing behind the platform barred gates.
- The platform bars closes the open plan space of the main concourse area, and isolates arrival/ departure areas from the concourse.

- Perspective sketch showing light and shadow hatching in the transfer hall. The point where the platform and concourse intersects is the darkest area.
- Daylight permeating into the main concourse is shadowed the lowered height of the station platform housing. The metal gates separate the platforms and main concourse.

3. PLATFORM GATES

restricted access

		no. of times
instance	A. Instances when people stand in the way of the peak hour passengers moving to and from the platforms	10
	B. People who walked straight into main concourse	50+

- Floor plan view showing coverage of platform shelter.

- Drawing that illustrates how the station platforms do not shelter the entire arrival and departure area.
- The construction material of the platform shelters do not allow arriving train passengers to see the concourse or any reference of the whole station.

- A staggering of vertical volume is shown in a section sketch of the station. The platform area is isolated from the concourse as it has the lowest lying roof/ ceiling.
- The lowered height of the platform shelter block direct light from emitting straight on to the platform areas.

4. TRAIN PLATFORMS

arrival and departure

		no. of times
instance	(A.) People who walked straight through and onto the trains	50+
	(B.) People who stopped to look at platform screen for train information (destination)	15

▲ Figure 4.05 // Observation location four image and drawings, Wellington Railway Station

CONCLUSION

Observation study

The purpose of the observational study was to highlight everyday occurrences in the way people act as a result of the interior environment of the Wellington Railway Station. In conclusion, this study found that:

- Waiting congestion occurs heavily in the main concourse, with the arrangement of movable bollards.
- People tend to remain behind barriers so that they are not in the way of direct passenger flows.
- The platform gates visually and physically isolate the main railway platforms from the main concourse and rest of the station.

- Passengers are not fully protected from all weather conditions on platforms, and the solid make-up of the platform shelters block daylight. If more daylight could be emitted it would mean the railway platform area would become more comfortable.

As William H Whyte used observation to study how people use space in urban environments, this observational study was used to highlight issues within the current site and propose areas of focus for the development of a new design.

▲ Figure 4.06 // Perspective image of the cardboard model testing circulation within the main concourse area

DESIGN DEVELOPMENT

Concourse circulation development

Following on from the observational study, this next section of the design development used physical cardboard modelling to test different ways in which the main concourse can move users from the ground floor to first floor and vice versa. The models also demonstrate how peak and off-peak users may move through the concourse with the different vertical circulation options.

One of the main issues found in the observational study was that the railway and bus platforms are separated from the main concourse area within the station. This section aims at exploring ways in which that

if the existing concourse was expanded, how would this improve interior circulation in the new transport interchange. As the modelling involved in this process was quick, it meant six iterations were produced. Each aimed to test how passengers could use the concourse as direct thorough and how other passengers could potentially be better guided to the first floor of the interchange. The iteration process found that in order to ease congestion of impeding passenger flows tangling with visitors that wish to spend time in the interchange, that their pathways had to be separated.

photo perspective:

plan:

front elevation:

1. MIRROWING RAMPS
long

The two long ramp ways alleviate peak hour numbers. Close the main entrance/ exit, the ramps can catch possible cutomers and others to the first floor.

2. MIRROWING RAMPS
short

The ramp at the east and western ends of the interchange help to break up groups of commuters. May be in the way too much for commuters exiting the west end

3. CONNECTED FOOTBRIDGE
platform facing

Mirrored twisting staircases are connected by a footbridge. This enables circulation to more of the first floor of the concourse.

▲ Figure 4.07 // Photos of physical circulation models with corresponding diagrams

4. CONNECTED FOOTBRIDGE
transfer hall facing

Mirrored twisting staircases are connected by a footbridge. This iteration helps to catch visitors entering from the Bunny Street entrance, but opposes arriving railway and bus passengers.

5. CONNECTED FOOTBRIDGE
square bridges

Using reflected straight staircase access, this iteration shows the footbridge that is connected all round. The squared form of the footbridge may make movement fragmented for passengers.

6. CONNECTED FOOTBRIDGE
angled bridges

Using reflected straight staircase access, this iteration shows an angular connected footbridge and provokes a more smooth movement on the first floor.

KEY:
- Peak commuter
- Off-peak commuter
- Journey route

DESIGN DEVELOPMENT

final concourse footbridge design

The final iteration model in the sequence of six was chosen as it maximised the area of circulation space; moving between the ground floor and first floor of the new concourse space. The angular form of the connecting bridges direct towards at the centre of the first floor, this was designed to direct the flow of visitors from the staircases and towards the cafe/ retail areas. By directing visitor flows, the design helps to disperse overcrowding as there are four connecting bridges throughout the length of the concourse.

Staircase on each side of the ticket gates are positioned to allow passengers to either move

straight past or walk up to the first floor. As already stated the final iteration was successful because it clearly separated contrasting visitor journeys within the interchange. To conclude, this physical modelling exercise was extremely useful in developing the form for a concourse footbridge circulatory system. Further work will be made to better define how the dimensions and final aesthetic of the footbridge as this model just shows the overall form.

▲ Figure 4.09 // Final footbridge circulation iteration model

DESIGN DEVELOPMENT

programmatic mapping

The following section as a part of the design development for this thesis was an investigation to test out compositions of different programmes with each of the three sections of the interchange; the eastern, southern and western blocks.

Shown above is a quick iteration of possible compositions of programme within the the eastern block of the interchange. The eastern block of the concourse can be allocated as an area for both hospitality and/ transport

facilities. Using arrows to illustrate how an individual could move in and around the different programmatic compositions of retail, hospitality and transport facilities.

▲ Figure 4.10 // programmatic mapping of eastern block

Shown above is a quick iteration of possible compositions of programme within the the southern or central block of the interchange. Explored through these drawings was to test how a large supermarket could sit in the central

block of the interchange concourse. What the drawings found was that a supermarket could sit within the confines of the existing foundation of the concourse area and offer multiple points to enter or exit.

▲ Figure 4.11 // programmatic mapping of southern block

Shown above is a quick iteration of possible compositions of programme within the western block of the interchange. In consideration of this area of the site being another point of pedestrian access, the

programmatic mapping placement allocated a generous thoroughfare for the connection to the bus terminal subway.

▲ Figure 4.11 // programmatic mapping of western block

DESIGN DEVELOPMENT

programmatic mapping concourse floor plan

From the loosely worked programmatic mapping exercise it gave an idea to how different programmes could sit within the new interchange. Illustrated above is the compositions placed in the given confines of the site. This exercise was helpful as it informed

how the interchange could be optimised and better used as a result of 'breaking up' each programme and allowing maximsed pedestrian access to.

▲ Figure 4.12 // basic floor plan and programmatic placing

DESIGN DEVELOPMENT

interior form typology

The following section of the design development explores how the composition of programme creates different patterns of movement. Starting from a basic square shape form, the experiment produces 24 iterations of possible interior programme arrangements.

Using fine hatching, the diagrams show how a person could access neighboring spaces. Concerning the site, this exploration shows how the ground floor and first-floor areas could be optimised as a result of a better breakdown and composition of the designed public programmes. As the key aim of this

thesis is to use interior architecture to optimise a transport interchange, the following study demonstrates how if points of access and clarity between different programmes can improve the chances of passengers interacting positively with the interchange. Each of the 24 iterations create different ways in which people can enter and move around the public areas of the interchange. In relation to the chosen site, having to work within an existing building means that some of the massing models could not be properly adaptable, in which case a series of three models were chosen, these will be explored in the next pages.

Development of models 16-18
ISO

Development of aligning entrances
ISO

Development of windows and entrances
ISO

Shown above is a progression of the three chosen models from the first iteration modeling, using a steel frame structure the programme modules allow the spaces to be more open and transparent. The purpose of

this experiment was to test how the area in and around different programme functions, like retail, could be optimised. The selected form expresses a greater sense of clarity, fluidity to interweaving movement of users.

▲ Figure 4.14 //25 Interior iteration models to test typologies

▲ Figure 4.15 // Final programme arrangement for retail and hospitality spaces

DESIGN DEVELOPMENT

defining interior language of entry ways

As the focus of this thesis is to redesign the Wellington Railway Station into a modern transport interchange, an important part of the design development of the redesign is to establish a cohesive and efficient main concourse area. Regardless of where or how a visitor enters the main concourse, the interior needs to read clearly, telling them where public and private areas are and of course where the closest mode of transport is.

This exercise aimed to explore the role of the internal entrance ways, and their order and hierarchy can determine how different

programmes within the interchange are perceived by the individual user.

▲ Figure 4.16 // Perspective image of circulation card model, design development

▲ Figure 4.17 // Drawings of interior language development

The drawings to the left were the process the design took to find a clear interior language within the interchange, the drawings aimed to distinguish a hierarchy of public and private space.

1. Iteration one: illustrates a combination of archways and linear form for public and private spaces. The smaller linear frames show a more closed, private sense of space while the larger size of the lower parts of the drawing give a more open impression - ideal for public spaces.

2. Iteration two: illustrates another combination of archways and linear framed entrances. The central piece of the drawing contrasts the other blocks of the interchange, however, the archways at the top give more of an open - public impression to them.

3. Iteration three: illustrates a more subtle combination of archway and square frame, but still uses a balanced hierarchy of public and private spaces for the concourse.

DESIGN DEVELOPMENT

Development of Ceiling Pattern

Following on from the circulation study, this section of the design development explores how iterative modeling was used to test how a new component of the interior can incorporate features of the existing building to enhance the user experience in the new interchange.

As a key design feature, a beautifully vaulted ceiling molds the ‘transfer hall’ of the station. The ceiling is what’s called a ‘groin vault’; an intersection of x and y-axis, helping to digest visitors in and out. The arch form of the vaults creates a larger vertical height in the ‘transfer hall.’ As a result of the curvature of the ceiling, the distribution of light and shadow creates a

dramatic atmosphere, and this would be an aspect of which could be executed in the new vault ceiling.

The large arching form of the existing 'booking hall' at the Wellington Railway Station creates a great vertical volume for the user travelling through, as one of the more notable moments of the station interior.

The 'vault ceiling' form was used as an inspiration for another vault ceiling for the proposed supermarket.

▲ Figure 4.18 // Vault ceiling interior, Wellington Railway Station

①. Existing vault ceiling //

②. Linear vault ceiling //

③. Conjoined vault ceiling //

④. Cross conjoined vault with long vault //

⑤. *Large vault with cross intersection pattern //*

⑥. *Cross intersection pattern //*

⑦. *Bubble cross section pattern //*

The purpose of this model exploration was to find a ceiling formwork that took reference from the ‘grand’ vault ceiling in the heart of the Wellington Railway Station (model no. 1). Designing the models first on Rhino and then using 3D printing to create a module of the ceiling form. This process found that when

multiple vaults to test how iterations of the vault could join and create an exciting pattern (model no. 3). By using six iterations, the exploration found that the use of a ‘cross vault’ pattern produced a ceiling that defined a linear pathways, in the same way the existing ‘groin vault’ does.

By producing six different iterations of a ceiling pattern, the final 3D print model presents a development of the original vault ceiling for the supermarket area on the ground floor of the main concourse. The chosen design helps to create direction through the use of a repeated module in a grid formation. Shown in the collaged photoshop is a visualisation of what the supermarket would look like. It contrasts the linear form of the shelving and the linear aesthetic of the supermarket 'case frame.' The proposed ceiling pattern can be used as a feature of the supermarket as it provokes movement and direction throughout the shopping area.

Lighting opportunities

The 3D print filament used in the development models for the supermarket ceiling allowed light to permeate through the surface of the model. Shown in the photoshop imagery

(figure 3.12), the curvature of the new ceiling helps to collect and hold light. In relation to the reality of creating this same effect, the ceiling would have to be made out of semi-transparent material. Alternatively, a similar lighting effect could be achieved by emitting artificial light up onto the patterned ceiling.

The purpose of this first plan of the supermarket was to test how different zones of the design could enable a multiple types of shopping; peak and off-peak commuters. The intention of the angle in the 'express lane' of the supermarket was so to accentuate the main thoroughfare out of the interchange so

that visitors could be encouraged to shop when traveling through the interchange. While also offering a 'cut through' journey for people not wanting to stop and hurrying to make their transport. Unsuccessful in this plan was the moveable shelving, as their shape actually made it harder for people to move through.

DESIGN DEVELOPMENT

The modern supermarket

As discussed in an article called ‘Trends shaping the future of grocery in New Zealand’, the way in which people are grocery shopping is changing, due to the development in technology. “Consumers are no longer shopping entirely online or offline; rather, they’re taking a blended approach, using whatever channel best suits their needs. The most successful retailers and manufacturers will be at the intersection of the physical and virtual worlds.” The article discusses the importance of assessing the

positive and negative attributes of grocery shopping in New Zealand and questions how an incorporation of digital technology could enable an easy and efficient shopping experience.

In relation to the redesign of the Wellington Railway Station, one of the more successful features of the interior is the New World Metro, as it enables commuters to quickly purchase items on the way to their destination. However, as addressed earlier the small size

of the supermarket often means in peak hours overcrowding occurs and adds to customers' frustration, as it has been highlighted that extended waiting times have a negative impact on people, particularly in transport interchanges.

According to the Nielson Group, one of the ways to improve in-store experience is to more control in the hands of the customer. Today it is recorded that 22% of global respondents say that they use self check-out, and nearly two thirds which is 65% are willing to do so in future. But what does this mean for a new supermarket in the redesign of transport interchange? Well in order to support an easy, efficient shopping experience in the new supermarket, the technology that supports the process in which people enter, pay and exit will need to be simple and universal. What will be proposed is a checkout free supermarket which allows customers to scan their desired items on their cellphones. QR scan codes will

be on every product and will mean people can complete their transaction via their cellphones as well.

Seen above is an illustration series, a top view perspective, the purpose of the drawings was to investigate how the point of entry and exit could enable better access to the supermarket. The most successful drawing was the sixth iteration, as it allowed multiple points of access, and works with the desired look and construction of a simplistic steel glazed case.

DESIGN DEVELOPMENT

Automatic ticketing gates

As a part of developing a more seamless and efficient journey through the new interchange, ticket operation and the purchase of tickets for transport, such as the bus and train - the implementation of an automatic ticketing system will see the heavily congested areas of ticket offices resolved.

The automatic ticketing system at the new interchange will ensure the following;

- Only paid bus and train passengers will be allowed to dwell on the platforms
- Waiting times for ticket offices will be eliminated in the new main concourse
- Will provide a more efficient journey for passengers who are wanting to enter or exit the interchange.

DESIGN DEVELOPMENT

renders of the developed design

Footbridge meeting platform areas, render shows distance between both is insufficient if the platform to concourse areas are to support fluctuating flows of passengers arriving and departing.

▲ Figure 4.26 // Rough render of the footbridge in the main concourse area

A layering of two sized archways were included as a way to encourage passengers to interact, the archway signifies as a space for the user, while the linear squared formwork above is meant to be closed to the public, as offices sit on top of the concourse area. Although the archways creat entries, they way not read as clear to the user of what they contain.

▲ Figure 4.27 // Rough render of the footbridge in the main concourse area

Implementing archways into some of the public areas, such as the first floor cafe area helps to define and continue the design style of the interior. Looking out into the main concourse area, the purpose of this positioning of the cafe and eatery area came from wanting to entice and display to arriving passengers to the interchange.

Side staircase that feeds into the footbridge. Explored in the first section of the design development was testing how implementing a footbridge could better connect the ground floor and first of the concourse.

View from under footbridge and moving towards the central supermarket in the main concourse area of the interchange. In this render the large doric can be seen in the distance - this was intentional as the interchange needs to show external visual shafts in which was studied in the literature review.

▲ Figure 4.30 // Rough render of the footbridge in the main concourse area

View of entry to supermarket, showing the formwork of the patterned ceiling and the product shelving below. The curvature of the ceiling contrast the linear framework of the surrounding supermarket and concourse area.

CONCLUSION

developed design

The design development chapter aimed to test interior architectural strategies set out by both the literature review and international case studies. An observation study provided an on site investigation into some of the issues affecting individual users behaviour.

In second section circulatory systems were explored to redesign the main concourse area so that movement through was improved. By taking out the original platform gates and extending out the concourse, closer to the train and bus platforms it found that both peak and off-peak movements could be accommodated better. This was because the main concourse no longer visually

excluded the arrival and departure areas, but brought them together and provided a more seamless transfer thoroughfare. The chosen 'footbridge' design now helps allow passage through, while also inviting visitors to the first floor, where a display of shops and cafes are available.

The third section interrogated the design of the new supermarket, developing a patterned ceiling inspired by the existing ticket hall vault ceiling, it contrasted the overall aesthetic and form of the supermarket design.

FINAL DESIGN

the capital gateway

The final design presents the conversion of a railway station towards a modern transport interchange that accomodates the continuous fluctuations of public transport patterns in Wellington. As a hub, the new transport interchange incorporates other areas of public interest, in the form of retail and hospitality, the purpose of the reallocation of these new spaces was to not just make a thoroughfare for public transport, but a place to visit and to what Edwards' describes, "the transport interchange or hub is a place of connection, public presence, and movement, it is an architectural expression of functionalism and movement acted out in the interweaving patterns of interior space, light, and technology."¹

Identified through the research was the importance of designing smooth and fluid connections between the key areas of transport modes and the pedestrian entry/exit ways. The final design presents visual

linkages between these points, as way to strengthen the journey through the new interchange.

Edwards, *Sustainability and Design of Transport Interchanges*, 110

1. Supermarket	7. Retail
2. Dry Cleaner	8. Post Shop
3. Magazine Store	9. Retail
4. Public Toilets	10. Offices
5. Cafe	11-14. Offices
6. Commercial Space	15-16. Retail

GROUND FLOOR PLAN

final design

Through the exploration of programmatic composition and the resulting circulation patterns through a transport interchange, the final design floor plan of the 'ground floor' illustrate how the transport interchange not only offers more for the public, but the allocation of movement through is greater.

The automatic ticketing system 'gates' were implemented as a result of a user analysis that highlighted that almost all of week day commuters used a prepaid fare, and the ticket office in the original station design caused more congestion in the concourse area. This

system means passengers of both train and bus used an integrated ticketing system that allows commuters to travel more efficiently in and out of the interchange. A significant part of the concourse ground floor is the new supermarket and retail area. Central in the interchange, the purpose for this was to entice people to purchase supplies, especially in peak hours of travel. The new supermarket is around 2x bigger than the original New World Metro, and uses a simple shelving system to minimise congestion within the supermarket.

1. Retail	7. Retail
2. Restaurant	8. Retail
3. Bar/ Cafe	9. Retail
4. Male Public Toilets	10. Offices
5. Female Public Toilets	11-14. Offices
6. Restaurant	15-16. Retail

FIRST FLOOR PLAN

final design

The final design for the first floor-plan of the concourse is the result of an iterative modelling, in both physical and digital processes. The experiments aimed to test how transport facilities and other public amenities such as hospitality and retail could be positioned in a way that optimised the floor area and enabled movement through.

The key aim of the final design of the first floor was to display and conceal a range of both transport facilities and public amenities,

this meant that the orientation and placement of entrances to each of the different spaces were considered towards how the visitor may view them. The ‘display’ of the retail and hospitality spaces (1, 2, 3 on floor plan) help to draw potential customers in as these spaces can be seen from the ground floor and train platforms. The footbridge is accessible to all visitors, ensuring both paying passengers and other visitors can access the shopping and hospitality areas of the interchange.

ENTRANCE TO SITE

relation to context

As a main entrance to the new transport interchange, the external facade of the existing Wellington Railway Station was left the same. In reference to the literature examined, providing clear external visual shafts in and out of a transport interchange was crucial as it provided passengers with better accessibility in travelling through an interchange. With this in mind, through entry to the interchange visitors will see straight into the main concourse through the central supermarket. By implementing this strategy

the final design shares a glimpse of what's on offer upon arrival to the interchange. The simplistic linear form of the supermarket area helps to contrast the classical style of the external facade of the interchange.

▲ Figure 5.03 // Image of Bunny Street entrance of interchange, final design

CAPITAL GATEWAY

the main concourse, an integrated hub

Upon arrival by train to the new transport interchange, passengers are greeted with an automatic ticket system that meets all train and regional bus platforms. The final design proposes an automatic ticketing gate system as apart of the modern transport interchange scheme. The purpose for this change was identified in the observational study, which showed heavy pedestrian congestion occurring in the main concourse area, obstructing peak hour passenger movements.

Shown in this perspective render image is the open, simplistic design of the new supermarket

and main concourse. The design has resolved tension between the retail/ commercial zones from the cross section of transfer movements by composing clear lines of navigation in and out of the main concourse area of the interchange. Also seen in this image is the upper office areas, closed off to the public, the impression is given by the small scale design of the office windows looking out into the main concourse

CAPITAL GATEWAY

the main concourse, an integrated hub

By centralising the new supermarket within the interchange, it works as a hub of movement and allows visitors, especially peak hour commuters to quickly pick up something on their way to work or way home. The simplistic style of the supermarket greatly contrasts against a beautiful ceiling pattern, inside the supermarket, which acts a visual aid for journey through.

▲ Figure 5.05 // Image of main concourse and supermarket, final design

CAPITAL GATEWAY

seamless transfer

As a pivotal part of the conversion from the original Wellington Railway Station, the new automatic ticketing gates help to smooth the journey from platforms to and from the main concourse.

Shown also in this perspective image of the main concourse, the new footbridge help to disperse other visitors from the platforms and also encourage them to check out the first floor arrangement of shops and hospitality spaces.

CHAPTER

FINAL CONCLUSION

5.

FINAL CONCLUSION

The intent of this thesis was to investigate how interior architectural strategies could optimise a transport interchange to encourage and support the use of public transport. It aimed to provide an interior architectural solution to convert the Wellington Railway Station towards a contemporary multi-modal transport interchange. A literature review investigated the design factors affecting the running of a modern transport interchange. The review established that since an interchange serves its user as a way through, its design must be used to enable the smooth and efficient travel between modes of transport, while also accommodating other needs of the variety of peak and off-peak commuters, through the integration of commercial amenities and public space. Case study analysis was then used to test the design factors discussed in the literature review, four international transport interchanges

were chosen to compare and contrast the strategies in which interior architecture was used to deliver a successful multi-modal interchange. The case study analysis also presented interior architectural strategies that were applicable to the redesign of the Wellington Railway Station site. The design development of the thesis was first driven by aiming to understand the current function of the Wellington Railway Station and how it could be improved. An observational study highlighted instances where obstruction of passenger movements was observed, i.e., congestion, insufficient seating and transport facilities. Drawings alongside these findings also helped to question how the information found through the literature review and case study analysis could positively benefit each outcome. The development of the observation sketches then motivated the next step, physical modeling of the station in which

the circulation and programmatic placement were explored. The critical areas of focus for the design proposition were to look at how the central concourse area could integrate commercial/ retail in and around the 'cross flows' of movement in the main concourse area, as this would optimise the floor area of the concourse and encourage a better social interaction with the new interchange.

The final design proposition manipulates interior architectural elements to enable the process of transfer through the transport interchange. As the aim of this thesis was to convert the original railway station towards a 'modern transport interchange,' the final design presents a redevelopment of the concourse area. By enlarging the overall floor area and the number of amenities open to the public, both the ground floor and first can accommodate the fluctuating numbers of passengers entering and exiting the interchange. Implementing new automatic

ticket gates on the railway and regional bus platforms ensures a seamless journey in and out of the interchange, while also minimising congestion for ticket office waiting lines. Tension between the interchange commercial/ retail areas is relieved by separating 'dwell' time areas away from key flow movements, meaning that travel efficiency is maximised and balanced.

Opportunities in the research

The findings from this research portfolio demonstrated the importance of the design process as it was to test how interior architectural strategies could be used to optimise the Wellington Railway Station, to convert it towards becoming a modern transport interchange. The first stages of the research consisting of a literature review and case study analysis successfully identified crucial areas of concern within a transport interchange. Following on from what was found in the research, the design development

was aimed at understanding key issues on site and then to resolve them by using both physical and digital modeling to test.

As this thesis process and outcome was heavily site focused and based, it meant that the final design resolution was really only reflective on the Wellington Railway Station. If this research was to continue, a focus on developing a universal methodology or framework could be beneficial as it could allow a wider range of design outcomes. To conclude the result of this exploration is a building which integrates the movement of people and modes of transport through a focus on circulation and spatial design of programme function which was designed through a process of physical and digital modeling. This thesis argues that the use of interior architectural strategies provides for a more integrated contemporary transport interchange.

REFERENCES

work cited

BIBLIOGRAPHY

“Arnhem Central Transfer Terminal / UNStudio.” ArchDaily. Last modified November 22, 2015. <https://www.archdaily.com/777495/arnhem-central-transfer-terminal-unstudio>.

Adams, John. *Transport Planning – Vision and Practice*. London: Routledge & K. Paul, 1981.

Alexander, Christopher & Ishikawa, Sara & Silverstein, Murray et al. *A Pattern Language – Towns, Buildings, Construction*. Oxford University Press, New York, 1977

Auge, Marc. *Non-Places: Introduction to an Anthropology of Supermodernity*. London: Verso, 2006.

Bruinsma, Frank R., Eric Pels, Hugh Priemus, Piet Rietveld, and Bert van Wee. *Railway Development: Impacts on Urban Dynamics*. 2014.

Edwards, Brian. *The Modern Station - New Approaches to Railway Architecture*. Chapman & Hall, London, 1997

Edwards, Brian. *Sustainability and Design of Transport Interchanges*. Abingdon: Routledge, 2011.

Enoch, Marcus. 2013. “Conceptualising the Transport Interchange”. *Traffic Engineering & Control*. 54, no.

“The Flinders Street Station Winning Proposal / HASSELL + Herzog & De Meuron.” ArchDaily. August 8, 2013. <https://www.archdaily.com/413042/the-flinders-street-station-shortlisted-proposal-hassell-herzog-and-de-meuron>.

Griffin, Kenneth W. *Building Type Basics for Transit Facilities*. Hoboken, NJ: Wiley, 2004.

Jones, Will. *New Transport Architecture*. London: Mitchell Beazley, 2006.

Kido, Ewa Maria. 2006. "Railway Landscape Design and Relationship with Form, Function and Aesthetic". Japan Railway & Transport Review.. no. 452-30.

Li, Linna, and Becky P. Loo. "Towards people-centered integrated transport: A case study of Shanghai Hongqiao Comprehensive Transport Hub." *Cities* 58 (2016), 50-58.
doi: 10.1016/j.cities.2016.05.003.

Lynch, Kevin. *The Image of the City*. Boston: Birkhauser, 2014.

Passini, Romedi. *Wayfinding in Architecture*. Van Nostrand Reinhold, New York, 1984.

"Public Transport Facts and Figures - Metlink." Metlink - Greater Wellington's Public Transport Network. n.p. <https://www.metlink.org.nz/customer-services/public-transport-facts-and-figures/>.

Richards, Brian. *Future Transport in Cities*. Abingdon, Oxon: Taylor and Francis, 2012.

Rogers, Richard. *Cities For A Small Planet*. Boulder, CO: Basic Books, 2008.

"Southern Cross Station, Melbourne, Victoria." Verdict Designbuild. n.p. <https://www.designbuild-network.com/projects/southerncrossstation/>.

"Trends Shaping the Future of Grocery in New Zealand." What People Watch, Listen To and Buy. Nielsen. <http://www.nielsen.com/nz/en/insights/news/2015/trends-shaping-the-future-of-grocery-in-nz.html>.

Ward, Tristan. "Criteria for Effective Transport Interchange." Master's thesis, Victoria University of Wellington, 1998. ProQuest (ARCH489).

“Wellington Railway Station.” IPENZ Engineers New Zealand. <http://www.ipenz.org.nz/heritage/itemdetail.cfm?itemid=85>

Whyte, William Hollingsworth. *The Social Life of Small Urban Spaces*. New York: Projects for Public Spaces, 2001.

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