the house reformed

A Reaction to Suburban Monotony
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A Reaction to Suburban Monotony

by

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Acknowledgements

Mum
Dad
Gabe
Sisters
Eve

and Simon
Thank you for your enthusiasm and support
Figure 3. A joyful interior - Town Planning by Peter Judson
The House Reformed

Abstract.

Joyless rows of monotonous houses are beginning to define the suburban typology of tomorrow. Quality and innovation is being compromised for speed and quantity and there is a distinct lack of consideration for the home’s potential to enrich and influence the life-styles and well-being of its occupants.

This thesis is a reaction to the researcher’s dissatisfaction with New Zealand’s suburban typology and seeks to identify and demonstrate an alternative design approach. The researcher considers that a house should enable its occupants to flourish by instigating moments of joy and surprise whilst maximising economy of space.

The thesis uses an investigative research method of five different design tests. Each test reveals strategies to aid the approach of designing the suburban typology, focusing on maximising joy, surprise and economy of space.

Both digital and manual methods are used, revealing their respective strengths and flaws. The Digital method used in the Data House and Rigid x Fluid house tests lacked the ability to apply tangible aesthetic qualities to a design. The manual hands on method of used in the Patchwork House and House Reformed tests was hugely beneficial for the aesthetic qualities of design, however it lacked the rigor and capacity to apply individuality on a mass scale.

Discoveries made in the thesis investigations are collated in a final design outcome, the House Reformed. This house design demonstrates a compilation of the successful strategies identified in the research and reveals the benefits of approaching home design with qualities of joy, surprise and economy of space. The most successful strategies used to achieve these aims were establishing a greater connection with the outdoors, providing flexible spaces through the use of innovative partitions and furniture and injecting unexpected aesthetic moments through the use of interesting texture and colour.

Overall the research reveals a successful design outcome and provides interesting insights into design method. It explores worthwhile questions and issues related to the lived domestic experience such as the lack of joy, surprise and economy of space in suburban housing and demonstrates the importance of designing with such qualities.
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Chapter one outlines the research proposition and its aims and objectives. The investigative methodology used is explained, and the many diversions and challenges presented by the design tests are justified. The clash between the computer and manual methods of design is an important aspect of this research and is illustrated to demonstrate the multiple pathways of the thesis process.
The aim of this thesis is to explore the New Zealand suburban typology, focusing on the distinctive characteristics of the modern household: daily routines, behaviours and the emotive influence of the domestic environment, and to design ways to enhance it. In this research the qualities and flaws of the suburban New Zealand house are analysed and critiqued, frequently revealing the absence of individuality and consequent lack of surprise and joy - an emotion that symbolises pleasure and delight. This thesis explored ways in which joy can be central to the suburban house.

In order to achieve the aims of the thesis, the research follows an investigative method that is iterative, through five different design tests, teasing out the design objectives. The final design is a proof of concept and a distillation of successful ideas in the earlier investigations. This final design presents an alternative design approach to the current penchant for mass designed and subsequently highly repetitive suburban houses.

The purpose or premise of this research came from a personal observation and a growing unease with the seeming joylessness and inefficiency of suburban typologies. The increasing number of greenfield sites being filled with rows of large, monotonous dwellings prompted me to question the integrity of the New Zealand house. I believe the intervention of higher architectural consideration is needed in the design of the suburban house if it to consume the landscape at such a rapid pace. The observations and my curiosity for an alternative approach has prompted the thesis proposition:

How can we approach the design of the detached suburban dwelling with economy of space, joy and surprise as intrinsic qualities?
1.2 Aims
This thesis aims to explore and compile a series of qualities and characteristics that constitute a well-designed house, one that enables its occupants to flourish and instigates moments of joy and surprise whilst maximising economy of space. A second aim is to investigate whether this can be achieved on a mass scale. In doing so, the research intends to critique the current state of suburban housing and to present the benefits of an alternative design approach.

1.3 Objectives
The following outlines the key objectives to be explored in order to meet the research aims:

• To identify design strategies that maximise moments of joy
• To identify design strategies that maximise economy of space
• To explore the use of a parametric system to enable a more responsive and individualised mass housing model
• To critically reflect on the digital versus traditional design process
• To demonstrate the benefits of designing with joy, elements of surprise and economy of space in the suburban house through a refined design outcome

1.4 Scope – Definitions and disclaimers
This thesis is by no means an attempt to pin down the definition of the ‘perfect house’. It is acknowledged that this is a very subjective and therefore unattainable ambition and prompts debate, which is far beyond the scope of this research. Instead, the research in this thesis looks to identify flaws in the current suburban typology and seeks strategies that inject moments of joy into the house, whilst also creating a higher level of efficiency and adaptability. These are qualities that I believe are essential in enriching the future of this typology.

Robin Boyd, in The Australian Ugliness, discusses the difficulty in defining what is ‘right’ in an aesthetic field, and reiterates the reasoning for defining strategies rather than defined solutions.

"Here is the difficulty which arises in some form in every study of any art: should we attempt to define it, to tie down what ‘right’ is when we say something looks right – right to whom, when, where? – or must we leave it free? Or can we do both, define it just sufficiently for comprehension and appreciation on the widest plane but not sufficiently to dampen enjoyment of it on any plane? No doubt every critic of art and age has tried for this compromise, and today the architectural critic is still trying." 1

Methodology & Thesis Structure.

01 Introduction
- Aims
- Objectives
- Scope
- Methodology

02 Context
- Current housing situation
- NZ building industry
- 'Joyless suburbia'
- Increasing floor areas
- Criteria for mass housing: Alison and Peter Smithson
- Findings of critique: Aesthetics of joy + Economy of space

03 'Data house'
- Employing parametric thinking
- Data House Investigation I
- Data House Investigation II
- Investigation reflections

04 'Patchwork'
- Mid-century NZ
- Japanese contemporary
- Patchwork House
- Patchwork House

05 Analog/aesthetic design driven

06 'Rigid x / fluid house'

07 'Patchwork house'

Figure 5. The research structure and its battle between digital and manual method
Introduction

- Mid-century NZ case studies
- Japanese contemporary case studies
- Patchwork House Investigation I
- Patchwork House Investigation II
- Rigid x Fluid investigation I
- Rigid x Fluid investigation II
- Stacked House investigation
- Investigation reflections

- Collating successful strategies
- Site
- Programme
- Exploration of aspect
- Formal exploration
- Final design outcome
- Comparative analysis

Conclusions

- Revisions in methodology
- Limitations
The thesis follows an investigative research method, teasing out the research objectives through a series of five design investigations. Both digital and manual methods are used, revealing their strengths and flaws.

The research begins by using theoretical method, with a critical written analysis, testing a typical suburban dwelling against Alison and Peter Smithson's Criteria for Mass Housing. Digital method is then utilised with the attempt at forming a responsive digital algorithm in order to control individuality on a mass scale. The Patchwork House investigations turn to manual methods of sketching and collage to identify strategies from both mid-century New Zealand and Japanese contemporary case studies.

Rigid x Fluid revisits the systemised method, however explores this with more human intervention, applying personal aesthetics and creative thinking.

Successful methods revealed in the investigations are utilised in the final design outcome, the House Reformed.

It is revealed that digital, systemised method, used in design tests, the Data House and Rigid x Fluid lacks the ability to apply tangible aesthetic qualities to a design. Manual methods of sketching, collage and analogue modelling, used in the Patchwork House and House Reformed tests lack the rigor and capacity to apply individuality on a mass scale, a key component of the aims.
07

The House Reformed

Introduction

Figure 6. A ‘battleground’ diagram illustrating process of methods
The following chapter provides the context for the research, supporting the proposition. The thesis aims are a reaction to personal observations of the quality of the current ‘Joyless Suburbs.’ These observations are presented and reflected upon and a small set of criteria for the following design investigations is established. Both quantitative and observational material is presented, including a comparison between a typical suburban dwelling and Alison and Peter Smithson’s ‘Criteria for Mass Housing.’
New Zealand is currently experiencing a housing supply shortage, most notably Auckland, Wellington, Christchurch and Queenstown. The lack of supply has been a significant factor contributing to the inflated property market in recent years. The housing crisis is most evident in Auckland where there is a current housing shortfall of approximately 10,000 homes and the pressure of a rapidly growing population. As Auckland’s population is projected to grow between 2.2 and 2.5 million over the next 30 years, around 400,000 new dwellings will be required by 2040; this means that at least 13,000 additional houses will be required each year. The lack of housing stock is continuing to lock New Zealanders out of the property market as housing becomes increasingly unaffordable. This is evidenced in the Auckland median house price which in 2015 is 8.2 times the median household income.

The Government’s initiatives to combat the housing crisis are aimed at adjusting new housing policy and regulations. In Auckland, this has prompted the creation of the Auckland Housing Accord, in order to facilitate qualifying developments in the ‘Special Housing Areas’ to be “streamlined and fast-tracked”, and open up access to large greenfield sites to be developed. This rigorous move is necessary. However, the hastily planned nature of these developments means that houses are being built quickly and at a lower quality to simply increase the housing stock. This presents the concern that quality house design is being compromised for the sake of speed and quantity, with little consideration for the inhabitants and their lifestyles, the effect the domestic environment has on their well-being or the impact these pop up developments have on the urban landscape.

This is a recurring problem in the New Zealand housing sector. In “Houses for the Homeless,” (see fig. 9) an opinion article in the New Zealand Design Review in 1949, reports of a housing development funded by the Wellington City Council and that “bad planning and ugliness are as conducive to bad living conditions as any lack of sanitation could be.”

The article stresses the importance of quality design considerations and questions whether bad planning and ugliness is necessary or do we want our cities to grow with building schemes that are more architecturally considered and socially responsive.
Houses for the Homeless

This group of eleven new houses was discovered by a young student during a Sunday afternoon walk at Otira Flat, six miles from Wellington. He reported his outraged feelings to the editor. The houses are illustrated to show that bad planning and ugliness are as conducive to bad living conditions as any lack of sanitation could be.

The surprising fact is that though they are built as low-cost houses, they are neither of minimum size nor construction. Cost is about £1,300 per unit, a figure for which attractive houses of a high standard are being built today. Yet these houses by their shocking design and weakness planning give the impression of a very poor standard. The scheme was financed by a Wellington City Council housing loan.

The environment the houses create has all the potentialities of slums without their use advantage—a feeling of community spirit and neighbourliness.

All in all it is obvious that the prospective owners who are forced to take up such a property by the housing shortage is getting far less than his money’s worth in comfort and quality of design.

Is this the way we want our cities to grow?

Should not such schemes be designed by trained architects and designers?

And should the City Council have supported such a scheme?

The illustrations reveal the most fundamental planning weaknesses, to reach the bathroom from the bedrooms practically every other room in the house has to be traversed. While the living-room is in use this would cause embarrassment.

The kitchen looks south on to a high clay bank only three feet away. Living-room cut up by cross-circulation and used as a passage from one room to another.

No paths, fences, or clothes drying facilities.
This frustration with the inadequate housing shortage solutions of the time saw the design of “The Demonstration House.” The Architectural Review of December 1948 presents its aim to demonstrate to New Zealanders “what good design can do to provide a good place to live.” This was in response to the 12,000 houses being built in New Zealand every year, which largely failed to adequately provide for the needs of their occupants and enhance the surrounding urban landscape.

This article demonstrates that sixty years ago, the architectural community recognised the damaging consequences of neglecting quality design in New Zealand housing schemes. These problems are still very prominent today, even with a wide-spread knowledge and appreciation of the importance of architectural design. Tony van Raat, newly appointed head of AUT’s architecture school articulates this in Metro magazine’s Building the Auckland House article:

Most developers don’t employ the best architects because the best architects want to build the best quality. Instead they engage average architects, often from overseas, who have cracked a formula which maximises rental floor space, is not too expensive to maintain, and looks good enough to flick on.\(^6\)

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New Zealand’s building industry is “small-scale and fragmented, with a lot of bespoke design, construction skills shortages, and low productivity.” All of these factors have an impact on housing supply and prices. The Productivity Commission has highlighted a need for innovative approaches to improve the efficiency of the housing industry, along with the encouragement of innovative building techniques and systems. With the introduction of innovative building technologies, more complex and varying house designs could be achieved. In 2005, The Future of Housing New Zealand report observed that “in the future, house building will be focused on meeting consumers’ raised expectations for quality, value and excellence in design. Customisation with the use of standardised components will allow greater choice for the consumer.”

Consumer expectation for excellence in design reflects the emotive impact of a house and its ability to create a sense of joy for its inhabitants. In the eleven years since this report, the building industry has failed to meet needs in this regard. Instead of using innovative technologies to offer greater choice, customisation and excellence in design, mass housing developments have offered the consumer little choice as instead house design has become increasingly standardised and consequently, increasingly dull.
Our obsession with resale crushes the potential of architecture, reducing it to the repetitive rearrangement of commodities: we are choking on our walk-in wardrobes, our ensuites and our entertainer's kitchens.\textsuperscript{13}
2.3 Joyless Suburbia

New Zealand’s small scale and fragmented building industry has constrained our ability to build well designed housing on a large scale. The resulting suburban typologies that this thesis references are housing developments characterised by monotonous rows of medium-density dwellings that appear to lack any design innovation or sense of joy.

In an attempt to meet Auckland’s urgent demand for 10,000 new homes, it is no surprise that many of these monotonous housing developments are being built throughout the region. Examples of such recent developments include: the Stonefields Development in Mt Wellington, the Belmont Development in Pukekohe, Pokeno Village in the Bombay Hills and Millwater located near Orewa, and the developments of Flat Bush and Karaka Lakes.

While some examples are better than others, I consider that all of these developments are highly repetitive, lacking in design innovation and therefore appear to lack any sense of joy. On 1 October 2013, the Auckland Housing Accord set a target of 39,000 new sections and dwellings to be consented by the end of 2016, many of which are part of these large housing developments. This developed typology is characterised by:

- Oversized detached dwellings
- Inefficient floor areas pushed right to the property boundaries, compromising outdoor living spaces
- Fronted by garages
- Dull colour palettes
- Cross hipped roof

In his latest book "New Suburban" Stuart Harrison examines the suburban type and ideal in Australian and New Zealand housing. He notes that many new suburbs share a familiar sensibility:

When we stand in a new suburban street in Brisbane we will sometimes feel like we may be in Perth, Melbourne, Adelaide, Sydney or Auckland.

The architectural community has widely discussed and critiqued the suburban typology of mass housing for many decades. According to O’Callaghan and Pickett, the architectural profession has distanced itself from the contemporary manifestation of the suburban house. As a result, innovative design ideas are not being represented in commercially viable, reasonably accessible homes. The undeniable fact is that the current pressures of the housing shortage, prompt ‘quick-fix’ solutions, it is easier and cheaper to turn modular, affordable materials into repetitive designs, and greenfield developments of “little boxes made of ticky-tacky” are more profitable than urban renovations. The longevity and social impact of these houses are not a priority.
The House Reformed Context
Philip Cox

“Many of the attributes that made the suburb what it was - such as the modest bungalow in a garden setting - are now being lost. The image of the house and garden in a leafy suburb is being replaced in many places by increasingly large houses on increasingly small lots. Reduced front setbacks are also resulting in streets that are no longer leafy. Others have criticised the lack of individuality that results from the mass produced project home.”


Travis Price

“Avoid permeates today’s landscape. Economies of scale ignore the scale of the spirit. The result is an architecture that promulgates isolation and homogeneity.”


Travis Price

“Churchill’s comment that “We shape our buildings; thereafter they shape us” takes on new meaning when we see so many buildings that shaped the same. Where does individuality reside?...All that is left of self-expression is the colour of the SUV in the driveway.”

Paul H. Mattingly

“Suburbia” regularly receives a ritualised critical scrutiny from scholars, journalists, and media commentators as a deleterious cultural force: smug, homogenised, oppressively middle-class, self-indulgent, and indifferent to its destructive impact on the city.”


Stuart Harrison

“The design quality of suburban houses has diminished as they have grown bigger.”


William S. Saunders

“In general, choices for residential design are limited, their styling traditional and risk averse. In a subdivision of hundreds of houses, all might look much the same.”

2.4 Increasing Floor Areas

Detached houses make up 70% of all new dwellings in Auckland. Over the past ten years the average size of a new detached house has risen from 218m² to 236m². This trend for bigger houses is evident in the Suburban mass-housing model as new houses are noticeably bigger than those of previous decades.

However, bigger is by no means better and the grandiose homes of these housing developments have attracted the unflattering name of “McMansion”. This analogy is most appropriate when compared to the Big Mac Hunger Buster. The Hunger Buster is advertised as “the stuff dreams are made of”. They are fast to make, BIG and only cost $12.50.

What the advertisements fail to mention are the dire consequences of eating Hunger Busters. They are made from processed meat, extremely high in calories and have little nutritional value.

In Sprawl and Suburbia Saunders comments that, “by any measure new homes are bloated.” It appears the effects of too many McMansions are already beginning to show.

The square meter cost of detached houses has risen sharply within the last ten years from $1,300 to $1,700, making large floor areas both uneconomical and unsustainable. This increasing floor area has redefined the traditional kiwi relationship with our exterior environment, as floor areas have been increased and stretched towards property boundary lines outdoor living areas have been compromised.

The trend of increasing floor areas is a direct contradiction to what is needed for a more sustainable future housing model. This poses the question: in the middle of a housing crisis, why do we continue to build bigger houses that cost more?

The building industry’s lack of innovative design consideration is fundamental to enabling the development of inefficient and unnecessarily large floor areas.
2.5 Criteria for Mass Housing: Alison and Peter Smithson

The Smithson’s are highly regarded for their many contributions to the architectural discourse on mass housing. They were not just theoretical architects but had practical experience in the design of a mass housing scheme, making them expert authorities on the subject. They were focused on the social effects the house can have on its occupants. To Alison and Peter Smithson, creating a house was not about designing a “smooth machine in good working order,” but constructing a place, a territory” that a structure should “welcome its appropriation by inhabitants, their patterns of use, their art of inhabitation.”

Alison and Peter Smithson’s 1957 manifesto titled, ‘Criteria for mass housing’ proposes various questions to test the design of mass housing and its impact on the inhabitants well being. Although there are a number of methods to test housing inefficiency, the Smithson’s criteria is specific to mass housing. Accordingly, I have chosen to use their criteria to critique the current suburban mass housing typology and use it as an “idea seed.”

In the following investigation, I have identified a house that I consider to possess the quintessential characteristics of a developed suburban house. This house is located in the large housing development of Stonefields in Auckland’s Mt Wellington, and is a detached, two-storied, 5 bedroom, 3 bathroom house. The house is tested against the Smithson’s criteria for mass housing and my personal observations are recorded.

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20 Smithson 10.
Figure 22. Alison and Peter Smithson's "Criteria for Mass Housing," 1957
1. The layout is quite restrictive with no adaptable partitions, or multifunctional spaces.

2. The architecture is a package. Houses in this development can be chosen from a series of designs, the houses are presented as a type of make/model, and the individual only has a false sense of identity as they choose their preferable model and its colours and furnishings.

3. There is little architectural consideration to begin with, so the addition of an individual's furnishings will have little effect on the house's architectural integrity. There is a lack of joy, no sense of surprise elements and intriguing spaces or textures to be compromised by individual's furnishings.

4. The house is well constructed and code compliant. It is very stripped back with little ornament or 'style left-overs'.

5. Many of the spaces are designed for specific functions, e.g. the kitchen, bathrooms, bedrooms which restricts adaptability. There are also many 'left-over' spaces as a result of structural tidiness. Specifically the entrance alcove which is a closed in space due to the adjacent kitchen storage and garage. The third lounge space at the top of the stairs is an awkward space as a result of the stair placement.

6. The property does have a reasonably large outdoor space at the back, which opens off a living room. Due to the restrictive interior partitions, the kitchen, dining and other living areas have no visual connection with this space. This creates a separated outdoor area unsupervised from the main living space.

7. There are two patio spaces at the back of the property, however appreciation of this from the inside is restricted. The separate lounge space and a bedroom at the back of the house opens onto the main patio and garden, however all other spaces lack connection with the outdoors. The Dining/Kitchen/Living space has a large floor to ceiling window, however this cannot be opened and looks to the side of the neighbours house. The second patio is accessed via the garage.

8. The quality of insulation is good. It is a new home that has passed building regulations and code. Opening up in good weather however has not been a primary concern in the design, there is little flow to the outdoor area, and the main room appears to lack sufficient sunlight.

9. The house has a sufficiently sized kitchen and three bathrooms, so has lots of 'wet areas.' It also has a double garage and two extra car park spaces, so there is plenty of room for washing and cleaning without disrupting the house.

10. The backyard is a reasonable size, it is sufficient for kicking a ball around, however it is out of sight of the main kitchen/dining/living area and therefore is unsupervised. The interior spaces are uninspiring and do little to stimulate the imagination.

11. There is a lack of general storage space with only two small storage closets in the house. All bedrooms have a standard sized wardrobe. The double garage is large but also houses the laundry leaving no space for storing bikes, camping gear etc.

12. All interior surfaces are light cream/beige including carpet and floor tiling, whilst unforgiving, is also low maintenance in terms of painting and repairing. The design of the house is very simplistic, with very few ornamental features, making the exterior easy to clean and maintain.

13. Car design is relative to the times, with car features continuously changing as technology advances. This house therefore does not reflect contemporary design standards, as there has been no attempt at improving design quality. The house, although is built to a sufficient construction quality, its materials and design only meet the minimum requirements. Joinery, fixtures and materials are at the cheaper end of the spectrum and therefore equate to the lowest car model.
14. The houses most definitely do not contribute anything to one another when put together, as they are all very much the same, with small differences in colouring in cladding types. When viewing this house from the street, aligned in a row with its neighbours, any sense of identity or individuality vanishes.

The immediate extensions of the dwelling
1. The house is situated on a quiet street with its front facade being dominated by a double garage. This encourages the use of the garage as a central point of access to the dwelling. Occupants will often drive into the garage and enter the house through a door located by the bottom of the stairs, a bathroom and a storage closet. This entrance is a lot more disconnected than the front entrance, which is accessed via a private path from the public footpath. There is little in the way of defining/securing the front of the property, with just a low open fence. This casual boundary promotes interaction with neighbours however the dominance of the garage then contradicts this.

2. The front of the property is not properly secured/fenced in, therefore is not appropriate for young kids or pets to play. Instead a tall fence sits in line with the front face of the house, restricting connection between the front and back exterior spaces of the property.

3. The dwelling seems to be trying to project the idea of the quintessential kiwi dream home, a ‘pavlova paradise,’ a detached house within a large front and backyard oasis. Instead it presents an image of an oversized caricature of a house. A bloated house squished onto its section, fronted by a double garage. It is the image that a kid would draw if asked to draw a house.

4. Yes these images can add up to the idea of the achieving the quarter-acre dream, which is socially valid in realising occupants desires of status. However this is just an image, which is of little substance. The external image of the house is literally a facade which is projecting something that it isn’t internally.

5. The design of the patio and garden areas are not sensibly considered, they are only accessible via the separate living room, a bedroom and the back of the garage. This creates a disconnect between the occupants and their external environment in their everyday routines. The gardens and streets are necessary to the life of the occupants, however the design of the dwelling and its surroundings does not encourage use of these, instead designed to be seen from the inside of a car.

6. N/A

7. Access is restricted by the geography of the site, being located in an old quarry. You can only exit or return via the east, as the north, south and eastern sides are all blocked by the quarry walls. This makes leaving or returning from the development a labour, and designed the use of the vehicle rather than by foot. The development has some amenities, however to access supermarkets, workplaces, retail and cafes, occupants need to leave the development.

8. Stonefields is not isolated, it is located within Auckland central, despite this it still looks like a camp, due to its repetitive rows of ‘bluegrey,’ ‘cookie cutter’ houses.
Figure 23. Interior and Exterior images of the Stonefields case study house
In testing my observations against Alison and Peter Smithton’s ‘Criteria for Mass Housing,’ I discovered that this house, which I identified as representing a typical developed suburban dwelling, has many flaws.

Restrictive layout is a key flaw; spaces offer no adaptability for different family situations and activities. The exterior environment cannot be appreciated sufficiently from the main kitchen/dining/living area, let alone be accessed easily. The design is very inefficient with an excessive use of space. Not one of the three separate living areas are big enough for a large gathering and there are three separate bathrooms. Despite this excessive use of space there is little storage space, which indicates poor spatial design considerations. Another key flaw is that the house lacks a sense of individuality as it is hard to determine from its similarly monotonous neighbours. Colour, texture and whimsicality are neglected.

From these discoveries I have developed my own criteria which I think are essential to include in future design experiments of the suburban house. ‘Aesthetics of Joy,’ and ‘Economy of Space,’ and will be used to test the validity of my research investigations.

2.6 Findings of critique: The Aesthetics of Joy and Economy of Space

In testing my observations against Alison and Peter Smithton’s ‘Criteria for Mass Housing,’ I discovered that this house, which I identified as representing a typical developed suburban dwelling, has many flaws.

Restrictive layout is a key flaw; spaces offer no adaptability for different family situations and activities. The exterior environment cannot be appreciated sufficiently from the main kitchen/dining/living area, let alone be accessed easily. The design is very inefficient with an excessive use of space. Not one of the three separate living areas are big enough for a large gathering and there are three separate bathrooms. Despite this excessive use of space there is little storage space, which indicates poor spatial design considerations. Another key flaw is that the house lacks a sense of individuality as it is hard to determine from its similarly monotonous neighbours. Colour, texture and whimsicality are neglected.

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Aesthetics of Joy

Joy is a primary term in the aims of this research and is best defined by Ingrid Fetell:

‘Joy is a very particular emotion. It’s not just happiness, which is too vague and encompassing a positive feeling. It’s not contentment, with its snug, muted warmth, but it’s also not spine-tingling ecstasy, nor is it the zen-like feeling we call bliss. Joy inhabits that ineluctable space between wonder and pleasure, neighbouring delight, but somehow more profound. Joy is momentary, but not temporary. Surprising, but not necessarily in a spectacular way. It is personal but at the same time universal, an essential emotion that renews and uplifts the human psyche.’

In relation to this research ‘aesthetics of joy,’ concerns exploring the intersection between architectural design and positive emotion.

Joy can be found in the unexpected, moments that instigate a smile. There is something about the charm and allure of a eye-catching yet subdued coloured object in the corner of the room amongst the neutral toned walls. The obscurity of what is behind the gracefully dancing curtain, as it flicks the viewer glimpses of space behind. The refracted pattern of fuzzy yellow light, drawing shapes on bare walls. The calming nature of a glimpse of green leaves balancing on its wobbling branch. The imperfection of a hand sculpted plaster wall.

21 Fetell
I have defined ‘aesthetics of joy’ as an important consideration in suburban house design as I see there is a need for people to surround themselves with things that inspire and provoke curiosity. The human psyche is complex and in order to flourish, a personal space that feeds our inner desires and creates a sense of identity is essential. Travis Price reiterates this idea in the designing of meaningful architecture:

“Architecture is not just about how to build, but why; and how do we build something that stirs us? Thinking about such considerations is the beginning of the poetry of designing diverse, meaningful architecture.”

This kind of diverse, meaningful architecture is rarely present in New Zealand suburbs.

Economy of Space

Economy of space aims to minimise built area whilst maximising its utility. This is achieved by building ‘up’ rather than ‘out’, smart storage design and features that optimise interior function. As a result, overall material and land use is reduced, having both economic and environmental benefits. There will be an emphasis on utilising the outdoors in domestic living environments.

A key component of economy of space is spatial flexibility. The inclusion of adaptable, interior partitions and multi-functional furniture allows space to function with greater versatility. Adaptable spaces help to foster social and intimate moments for the occupants, as space

22 Price 28.
In industrial mass production aesthetics and well-being are not emphasised. Industrial mass production of goods and environments is designed for and based on a rational, cost-benefit view. The touch and care of human hands and minds, as we know so well and love in the arts and crafts, is not present and we do not identify with or care for mass-produced entities. On the other hand, could not mass production give us just as high aesthetic quality if we investigated what makes people feel well and healthy, and if great attention and resources were invested in experimental prototypes.

This chapter presents design research into a responsive mass housing model, emphasising individuality, in reaction to the monotonous rows of ‘McMansions’ that dominate the current suburban mass housing model. Parametric thinking is explored, through both digital and manual methods. Using the computer software Grasshopper, I test whether the design of well considered, joyful homes can be automated to respond to different household incomes and land sizes. This thinking is then tested manually when it becomes apparent the computer method neglects the human aspects of social interaction and aesthetics.
Key aims of the data house investigations:

- Combat the lack of individuality of the suburban house when designed on a mass scale
- Reduce the suburban house footprint
- Create opportunity to devote more resources to interesting/innovative design features to maximise moments of joy and surprise
Employing parametric thinking.

The first data house investigation is based on Shohei Matsukawa’s Topological Grid (see fig. 28), in which a computer algorithm searches possible design solutions within a set of controlled parameters. The aim is to produce a multitude of unique, well designed configurations that can be applied to the design of suburban mass housing.

For my parametric design algorithm I used Grasshopper computer software (see fig. 27) to create a series of rectangular volumes that represented different rooms in the house. The aim of the algorithm was to allow the size and shape of each volume to change responsively to one another, within a controlled bounding box acting as a site parameter.

Like the Topological Grid tests, the controlled site parameter restricts any possibility of spatial bloating, forcing efficient spatial design to be applied to any site, whilst creating well considered interior spaces without building the same design over and over again.

Figure 27. Above: Shohei Matsukawa’s Topological Grid enables dynamic searching among finite possible solutions, each of them adapted to suit the given context.

Figure 28. Next Page: Output combinations of Shohei Matsukawa’s Topological Grid.
Figure 29. The Grasshopper algorithm used to control the parameters of height, width and length of volumes within a bounding box.

Figure 30. The volumes being controlled by the algorithm parameters.
Data House Investigation I.

The test site was divided into 4 responsive volumes that could be manipulated by height, width and length. Each volume represented a different room in the house and was given a base percentage of the total floor area. When one room’s floor area was manipulated, the percentage value of the other floor areas would adjust accordingly to maintain a fixed area of site coverage.

After establishing the site and budget, my intention was for the algorithm to produce a vast number of possibilities for the spatial organisation of the 4 volumes. The following diagram (see fig. 32) explains the conceptual ideas behind the investigation. This was visualised to reach a complex point where the automated system could configure a kit of parts of exciting design features, such as flexible partitions and in built furniture within a small footprint.

Creating a complex algorithm to test the aims proved extremely difficult. Even creating a simple formula (see fig. 30) was very technical, so this digital parametric exploration was only developed to a certain point. I saw the potential in the parametric concept for individualising the suburban house, so proceeded to explore this design method manually.
Formulating a Responsive Digital Algorithm.

1/ spatial configuration
   - room percentages
   - room adjacencies
   - 3 dimensional spatial layout
   - integrated exterior living spaces
   - zoning boundaries
   - spatial orientation

2/ structure + external cladding

3/ glazing, natural lighting + climate control
   - minimum glazing percentages per room
   - optimal design to maximise lighting + vision to exterior, whilst retaining cost efficient climate control

4/ partition design/space division elements
   - relationships + connections between spaces
   - functional partitions (storage/in-built furniture)
   - splits levels or height variations

5/ cabinetry/storage + in-built furniture design
   - clever + efficient storage solutions to maximise space use + aid room functions

6/ materials + finishings
   - explore cost effective yet elegant solutions

7/ costing
   - what factors are mandatory (must remain at the model’s most reduced level) - spatial quality, lighting, comfortable climate
   - what factors can be scaled up and down - materials + finishings, amount of furniture, floor area

Figure 31. Visualising the ‘kit of parts’ - the above concepts were originally visualised to also be controlled by the algorithm, responsive to different conditions.
Figure 32. A diagram explaining how the kit of parts was visualised to come together after site conditions and budget was established.
Using instinctive logic and knowledge of successful spatial layouts, I configured interesting floor plans on different sites. Whilst still designing the house in an abstract form of volumes I was able to consider aesthetic and also social aspects, such as how the family interacts, and creating pockets of outdoor spaces dispersed within the interior floor plan to suit the family scenario, with more control.

To frame the test within realistic site restraints, different Auckland housing zones, under the Auckland Unitary Plan were explored. The different zones of ‘Single House Zone’ and ‘Mixed Housing Zone’ were explored in order to remain within the scope of a single detached dwelling. These Zones were tested with differing conditions; different number of levels, site size and shape. The different zones also added the conditions of maximum site coverage, maximum building heights and boundary controls. Site size and shape was first selected, from which spatial configurations were created. Research conducted from the case study investigations allowed me to apply a fixed average percentage to each room. Once the overall floor area of the building was established, these percentages were calculated in square meterage.

The spatial layout design of each house was based on a few key aspects; integrating outdoor living spaces into the floor plan (and also maximising access to the outdoors from as many rooms as possible), interesting floor plan layouts and careful consideration of public and private areas.
1 Site - Size & Shape

2 Zoning Boundaries

3 Room Calculations

4 Outdoor Integration

5 Room Configurations

6 Resulting House Design

Figure 33. A visual explanation of the process of Data House Investigation II
Single House Zone
1 Level
Site: 600m²
Site Dimensions: 20 x 30m
Max Site Coverage: 210m²

Single House Zone
1 Level
Site: 600m²
Site Dimensions: 12 x 50m
Max Site Coverage: 210m²

Mixed Housing Zone
(lower density)
1 Level
Site: 600m²
Site Dimensions: 12 x 50m
Max Site Coverage: 240m²

Mixed Housing Zone
(higher density)
1 Level
Site: 600m²
Site Dimensions: 24 x 25m
Max Site Coverage: 240m²

Mixed Housing Zone
(lower density)
2 Level
Site: 150m²
Site Dimensions: 10 x 15m
Max Site Coverage: 60m²
Figure 34. Design outcomes of manual parametric process - Spatial layouts were tested on different sites with different zoning constraints, with a key emphasis on integrating outdoor living into the floor plan.
Investigation Reflections.

The formation of a responsive algorithm was too complex, and I found the rigidity of computer controlled design restricted aesthetic and creative design features. This approach still requires intervention of human thought to control ultimate conditions and desirable aesthetic features.

The manual tests again, failed to explore creative design features as the systematic approach of configuring regular boxes was still too restrictive.

Ultimately, both investigations were unsuccessful in achieving their aims. However, the explorations of integrating outdoor living space within the interior floor layout were positive and will be used as a strategy for maximising joy and economy of space in the suburban house moving forward.

Figure 35. The Parametric system abstracted
“We New Zealanders live in a chaos of unplanned speculative building under an unthinking, self-seeking system of land sub-division. Our suburban bias spread their tentacles along all the city traffic routes; our children cross streets to get to school; our wives buy in inadequate and too-distant shops lining the main roadways; our hospitals are over-crowded; our transport system is overloaded; our homes are ill-planned, graceless and monotonous in their petty variety.

We know there is another way of living...”

This chapter reacts to the restrictions of the parametric method in the ‘data house’ chapter. The tests that follow explore the more human aspects of social interaction, ergonomics and aesthetics. Case studies from the two different architectural canons of mid-century New Zealand and Japanese contemporary are analysed and strategies that contribute to injecting moments of joy, surprise and economy of space are identified. These strategies are documented through methods of sketching and collage and are then quilted together in the form of six design tests, the ‘patchwork’ houses.
Key aims of the patchwork house investigations:

- Identifying the aesthetics of joy
- Identify strategies to maximise economy of space
- Apply these strategies to specific family scenarios to introduce extra constraints and design for individual situations

Figure 36. Interior of a mid-century New Zealand case study house
Mid-Century modern New Zealand architecture is analysed in this research for a number of reasons. The Mid-Century period in New Zealand was fundamental in the attempt at establishing a New Zealand identity and vernacular architecture. This focused on responding to the casual lifestyle of the common kiwi and their strong connection with the exterior environment. Many design features that are common in successful examples of New Zealand houses today were established during this period.

This post war period saw New Zealand in a similar context to today's, in terms of a housing shortage. In opposition to the "poor design" of the Government built state houses that were dominating the New Zealand suburban landscape, architects of the time, such as the Group Architects, sought to design cost-effective, highly considered houses.

The ideals of these architects, aligned with international modernist discourse, whilst searching for a unique New Zealand architectural style. As Julia Gatley states, "The 1940s were notable for both the acceptance of modernism and the search for a New Zealand version of it." This prompted proliferation of the design of the mid-century modernist houses adapted to the New Zealand climate and lifestyle, pared back to the pragmatism and simplicity of the farm shed; forming an interesting perspective on the New Zealand vernacular.

These houses express a sense of homeliness with their approach to casual kiwi living, emphasis on textures, art and family life, they are fairly modest in design, not flashy designs for the wealthy – but were designed for middle-class kiwi families from 1945 to 1975, focused on bringing architecture to the "everyman."

The following case studies are good examples of environments that possess aesthetics of joy and maximise economy of space. They do this through the following strategies:

- Change in levels
- Innovative partitions
- Emphasis on relationship with the outdoors
- Abundance of texture and colour
- The use of furniture as room dividers
- Built-in furniture/storage solutions
- Intriguing viewpoints/aspect

---

3 Gatley 27.
4 Gatley 25.
Mid-Century New Zealand Case Studies.

1. Alington House
   1962 / Bill Alington

2. Lomas House
   1955 / Peter Middleton

3. Newcomb House
   1963 / Peter Bartlett

4. McKenzie House
   1958 / Cedric Firmin
Figure 37. Plans and exterior views of the mid-century New Zealand case study houses. Plans drawn by author. All photos sourced from Modern: New Zealand Homes from 1938 to 1977.
Figure 38. Interior images of the mid-century New Zealand case study houses.

Levels.

Figure 39. Drawings illustrating the different use of levels in the mid-century case study houses. Newcombe house features the living, dining and study in one space, defined by split levels, allowing interesting points of communication, helping to maximise joy and economy of space.
Innovative partitions.

Figure 40. Drawings illustrating innovative partition types evident in the mid-century New Zealand case study houses. Curtain partitions in the Alington house provide adaptability of a space whilst adding a unique, textural design feature.
Relationship with the outdoors.

Figure 41. Drawings illustrating the emphasis that the mid-century New Zealand case study houses place on the interior’s relationship with the outdoors, a key strategy for maximising joy in a house. All of the houses employ strategies of “transparent barriers” between the interior and exterior.
Abundance of texture + colour/artistic features.

Figure 42. Drawings illustrating the use of texture, colour and artistic features in the mid-century houses, these unexpected and unique features inject moments of joy throughout the house.

Furniture as room dividers.

Figure 43. Drawings illustrating the different ways the case studies use furniture as room dividers, An exciting, joyful and also efficient approach to room definition; minimising static partition walls which limit the potential of both joy and economy of space.

1. Uren House  
2. Alington House  
3. Wilson House
Built-in furniture/storage solutions.

Figure 44. Drawings illustrating built-in furniture and storage solutions evident in the mid-century case study houses; these houses utilise every wall and piece of furniture possible.
Intriguing viewpoints/aspect.

Figure 45. Drawings illustrating intriguing viewpoints/aspects evident in the mid-century case study houses: “transparent barriers” and arbitrarily shaped openings enhance joy by strengthening occupants connection with the exterior environment and creating interesting lighting qualities.
Analysis of room proximities.

These case study houses were also analysed in terms of their common room sizes and configurations. Rooms were applied privacy and proximity values in order to try and quantify the analysis and gain more knowledge on an ideal room configuration, as explored in the previous data house tests. The following analysis reveals the average room sizes and most commonly adjacent room combinations in the Mid-Century New Zealand case studies. The analysis of room adjacencies and their different privacy values prompts thought about interesting partition types to suit the different room combinations and their relationship to one another.
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^ Figure 46. Proximity values are applied to different room combinations in the Alington house. These values range from 1 (being directly adjacent) to 10 (being at opposite ends of the house).
### Analysis of room proximities.

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*Note: The diagram represents the analysis of room proximities in the context of two case studies: The House Reformed and The Patchwork House.*
<table>
<thead>
<tr>
<th>Configuration</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Bedroom (2) + Bedroom (3)</td>
<td>Connecting two bedrooms</td>
</tr>
<tr>
<td>Bedroom (2) + Laundry</td>
<td>Connecting bedroom and laundry room</td>
</tr>
<tr>
<td>Bedroom (3) + Bedroom (4)</td>
<td>Connecting two adjacent bedrooms</td>
</tr>
<tr>
<td>Bedroom (3) + Study</td>
<td>Connecting bedroom and study room</td>
</tr>
<tr>
<td>Bedroom (2) + Studio</td>
<td>Connecting bedroom and study room</td>
</tr>
<tr>
<td>Bedroom (3) + Studio</td>
<td>Connecting two adjacent study rooms</td>
</tr>
<tr>
<td>Bathroom + Bedroom (2)</td>
<td>Connecting a bathroom and another bedroom</td>
</tr>
<tr>
<td>Bathroom + Bedroom (3)</td>
<td>Connecting a bathroom and another bedroom</td>
</tr>
<tr>
<td>Bathroom + Bedroom (4)</td>
<td>Connecting a bathroom and another bedroom</td>
</tr>
<tr>
<td>Bathroom + Study</td>
<td>Connecting a bathroom and study room</td>
</tr>
<tr>
<td>Bathroom + Laundry</td>
<td>Connecting a bathroom and laundry room</td>
</tr>
</tbody>
</table>

**Figure 47.** Room proximity analysis of each of the mid-century case study houses.
### Analysis of room proximities.

<table>
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<tr>
<th>Combinations</th>
<th>Proximity Value Averages</th>
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</tr>
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<tr>
<td>B+B+Bathroom</td>
<td>7.0</td>
</tr>
<tr>
<td>B+B+B(2)</td>
<td>5.9</td>
</tr>
<tr>
<td>B+B+B(1)</td>
<td>10.0</td>
</tr>
<tr>
<td>B+B+B(4)</td>
<td>4.0</td>
</tr>
<tr>
<td>B+B+B+Studio</td>
<td>3.4</td>
</tr>
<tr>
<td>B+B+B+Laundry</td>
<td>4.1</td>
</tr>
<tr>
<td>B+B+B+G</td>
<td>5.3</td>
</tr>
<tr>
<td>B+B+B+R</td>
<td>7.0</td>
</tr>
</tbody>
</table>

**Figure 48.** Room combinations with an average proximity value of 3 or less are defined as the most commonly adjacent room combinations in the Mid-century New Zealand case studies.
1. $K + O = \text{living, dining, kitchen}$
2. $K + D = \text{living, dining, kitchen}$
3. $K + L = \text{living, dining, kitchen}$
4. $L + O = \text{living, dining, kitchen}$
5. $L + S = \text{living, dining, kitchen}$
6. $L + D = \text{living, dining, kitchen}$
7. $D + O = \text{living, dining, kitchen}$
8. $B(m) + B = \text{living, dining, kitchen}$
9. $B + L = \text{living, dining, kitchen}$
10. $B + R = \text{living, dining, kitchen}$
11. $B + B(2) = \text{living, dining, kitchen}$
12. $B(2) + O = \text{living, dining, kitchen}$
13. $B(2) + S = \text{living, dining, kitchen}$
14. $S + O = \text{living, dining, kitchen}$
15. $R + O = \text{living, dining, kitchen}$
16. $S + O = \text{living, dining, kitchen}$

Figure 49. The 16 most commonly adjacent room combinations out of the 90 possibilities. Notable combinations are the living, dining and kitchen areas all adjacent to the outdoor living, the bathroom is also commonly adjacent to other wet areas such as laundry, and private bedrooms.
Analysis of room sizes

Figure 50. Rooms are analysed in terms of their size as a percentage of the total floor area.
<table>
<thead>
<tr>
<th>Room</th>
<th>Average</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>5.1%</td>
<td>2.7%</td>
<td>8.1%</td>
</tr>
<tr>
<td>L</td>
<td>14.1%</td>
<td>9.2%</td>
<td>20.3%</td>
</tr>
<tr>
<td>D</td>
<td>4.7%</td>
<td>3.2%</td>
<td>8%</td>
</tr>
<tr>
<td>B(master)</td>
<td>7.4%</td>
<td>5%</td>
<td>10.4</td>
</tr>
<tr>
<td>B(bathroom)</td>
<td>3.7%</td>
<td>2.8%</td>
<td>5.4%</td>
</tr>
<tr>
<td>B(2)</td>
<td>6%</td>
<td>3.5%</td>
<td>8.3%</td>
</tr>
<tr>
<td>B(3)</td>
<td>6%</td>
<td>3.8%</td>
<td>8.3%</td>
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<tr>
<td>B(4)</td>
<td>5.4%</td>
<td>4.2%</td>
<td>6.6%</td>
</tr>
<tr>
<td>S</td>
<td>7.2%</td>
<td>2.4%</td>
<td>11.2</td>
</tr>
<tr>
<td>R</td>
<td>9.2%</td>
<td>3.2%</td>
<td>10.4%</td>
</tr>
<tr>
<td>L(laundry)</td>
<td>2.3%</td>
<td>0.8%</td>
<td>4%</td>
</tr>
<tr>
<td>S(studio)</td>
<td>7.4%</td>
<td>7.4%</td>
<td>7.4%</td>
</tr>
<tr>
<td>G</td>
<td>15.9%</td>
<td>12.9%</td>
<td>20.8%</td>
</tr>
<tr>
<td>O</td>
<td>29.5%</td>
<td>15.4%</td>
<td>46.6%</td>
</tr>
<tr>
<td>C(liv)</td>
<td>9.3%</td>
<td>4.5%</td>
<td>11.5</td>
</tr>
</tbody>
</table>

Figure 51. Data from the analysis allows me to identify the average size each room is commonly assigned as a percentage of the total floor area, in the mid-century case study houses. Minimum and maximum percentages are calculated to guide future spatial design decisions.
Analysis of room privacy.
Figure 52. Rooms in each house are assigned a privacy value ranging from 1 (public) to 5 (very private).

Figure 53. Alington House with curtain room dividers.
Exploration of partition possibilities.

Most commonly adjacent rooms
(with an average proximity value under 3)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>K</td>
<td>O</td>
</tr>
<tr>
<td>2</td>
<td>K</td>
<td>D</td>
</tr>
<tr>
<td>3</td>
<td>K</td>
<td>L</td>
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<tr>
<td>4</td>
<td>L</td>
<td>O</td>
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<tr>
<td>5</td>
<td>L</td>
<td>S</td>
</tr>
<tr>
<td>6</td>
<td>L</td>
<td>D</td>
</tr>
<tr>
<td>7</td>
<td>D</td>
<td>O</td>
</tr>
<tr>
<td>8</td>
<td>B(master)</td>
<td>B(bath)</td>
</tr>
<tr>
<td>9</td>
<td>B(bath)</td>
<td>laundry</td>
</tr>
<tr>
<td>10</td>
<td>B(bath)</td>
<td>R</td>
</tr>
<tr>
<td>11</td>
<td>B(bath)</td>
<td>B(2)</td>
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<tr>
<td>12</td>
<td>B(2)</td>
<td>studio</td>
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<tr>
<td>13</td>
<td>B(4)</td>
<td>S</td>
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<tr>
<td>14</td>
<td>S</td>
<td>O</td>
</tr>
<tr>
<td>15</td>
<td>R</td>
<td>O</td>
</tr>
<tr>
<td>16</td>
<td>studio</td>
<td>O</td>
</tr>
<tr>
<td>17</td>
<td>GW</td>
<td>O</td>
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</tbody>
</table>

Privacy Values

Figure 54. The privacy values of each room are compiled alongside the most commonly adjacent room combinations.
3. L + O =

> privacy values 2 + 1
> interior to exterior space partitions must be
> full length + width of wall
> thermal + sound barrier
> as much visual connection as possible

Figure 55. The most commonly adjacent rooms are analysed in terms of possible partition types that would optimise the relationship between rooms and be most appropriate for their privacy levels.
Figure 56. House A by Office of Ryue Nishizawa, 2007
The Japanese contemporary dwelling case studies that follow were chosen for analysis of their extreme strategies of injecting joy and economy of space. The research acknowledges that the Japanese family house has traditionally had a very different mode of function compared to Western society. Household activities and interactions in the Japanese home have historically taken place in very close proximities, within one main room that adapts and responds to different functions. Western design principles however, have grown to accommodate the use of different rooms for different household functions. These Japanese contemporary case studies were chosen for their unconventional yet minimal design approach to the single family home.

The following case studies are good examples of environments that possess aesthetics of joy and maximise economy of space.

They do this through the following strategies:

- Change in levels
- Tall volumes
- Interesting viewpoints
- Multi-use spaces
- Integration of the outdoors
- Elements of Surprise
- Double functioning Surfaces
Japanese Contemporary Case Studies.

4. House A
2007 / Office of Ryue Nishizawa

5. Kyoto House
2015 / SANDWICH + team low-energy

6. House in Itami
2012 / Tato Architects
Figure 64. Interior images of the Japanese Contemporary case study houses

This page (clockwise from top left): House in Kokubunji, Suken House, Kyodo House, House in Kokubunji, House A, House A, Kyodo House

Opposite Page (clockwise from top left): House NA, House in Itami, House in Kokubunji, House in Kokubunji, House in Itami, House in Itami, House in Kokubunji
Levels.

Figure 65. Drawings illustrating the use of levels in the Japanese contemporary case studies; similar to mid-century strategies of levels however these case studies are often constrained by land, levels are therefore used to stack spaces in innovative ways.

1. House NA by Sou Fujimoto, 2010
2. Sunken House by Coelacanth and Associates, 2010
Tall Volumes.

Figure 66. Drawings illustrating the inclusion of tall volumes in the Japanese case study houses. This strategy gives the occupant the impression of greater space, allowing floor areas to be reduced. Extreme heights rather than widths are utilised to elicit joy as well as maximising economy of space.

2. Kyodo House by SANDWICH + team low-energy, 2015
Interesting viewpoints.

Figure 67. Drawings illustrating the interesting viewpoints included in the design of the Japanese case study houses, creating moments of surprise and unexpected joy, encouraging unconventional communication between occupants and glimpses of the ordinary from unusual angles.

2. Sunken House by Coelacanth and Associates, 2010
3. House NA by Sou Foujimoto, 2010
Multi-use spaces.

Figure 68. Drawings of case study houses that include multi-use spaces - spaces with no intended function, instead they accommodate a multitude of activities enhancing the flexibility of the house.
Adaptable spaces.

Drawings illustrating how spaces are made adaptable in the Japanese case study houses, innovative use of partitions is key, with the Sunken house being completely malleable.

1. Sunken House by Coelacanth and Associates, 2010
Elements of surprise.

Figure 70. Drawings illustrating how the Japanese case studies include elements of surprise in their designs; moments of the unexpected such as a toilet that looks like a cupboard, or joyful design concepts of a tree like structure.

1. Kyodo House by SANDWICH + team low-energy, 2015
2. House in Itami by Tato Architects, 2012
3. House NA by Sou Foujimoto, 2010
Double functioning surfaces.

Figure 71. Drawings illustrating how double functioning spaces maximise economy of space and create interesting and unexpected design features; stepping onto a cupboard to reach the stairs creates a certain sense of novelty, an exciting and unconventional approach to circulation.


2. House in Itami by Tato Architects, 2012
Once the case study houses were analysed and clear strategies were drawn from these, a quick process of ‘hunch’ designing started.

In the data house investigations, designing a house for an unknown client proved difficult, therefore the following family scenarios were developed in order to provide individualised constraints. Statistics of current New Zealand family make ups were gathered and five scenarios were developed for testing the case study strategies. These scenarios were visualised to have specific needs, desires and space requirements to design for.

Although these houses were conceptualised as being imaginative, they ended up being too conventional and visually lacked intrigue when aspects of walls, windows and cladding were added.

These tests revealed just how difficult it was to reimagine the current house layout without making it unliveable. Spaces were as before with separate rooms for different functions, despite efforts to add moving partitions and innovative storage.

> 

**Figure 72**. Five different family scenarios and their specific design considerations, developed for testing the case study strategies. Floor areas are based on the average floor area of a New Zealand house at 205m² with an the average household size of 2.5 people, averaging 82m² per person. Each scenario dwelling size is calculated by adding/subtracting 9.2% floor area per extra bedroom, as based on the previous mid-century case study analysis and then reducing this by 20% to maximise space efficiency. The percentages are representative of each household type in the context of the New Zealand population.[7]

---

C.  
2 parents  
1 teenager  
1 grandparent  

- floor area - 192m²  
- average 48m² per person  

• grandparents need private/independent space  
• also need easy access between common areas and the grandparent's private area  
• teenager needs private space  
• parents also need private space  
• spacious communal area that accommodates all 3 generations, allows easy communication  
• easy access to an outdoor space for adults to sit and enjoy sun etc  
• garage  
• sufficient dining space for all to eat together  
• sufficient kitchen area for more than one person to cook/prepare snacks/talk  
• appropriate and accessible storage for older and younger occupants

D.  
single person  

- floor area -57m²  
- average 57m² per person  

• privacy is less of an issue for single occupant and therefore allows more space for living/entertaining areas  
• however do need option of concealing private areas/clutter from visitors if desired  
• sufficient room to accommodate guests  
• low maintenance and sufficient storage to hold all possessions

E.  
1 parent  
1 child  

- floor area -120m²  
- average 60m² per person  

• potential for accommodating guests regularly e.g. grandparent, friend of child  
• storage for bikes, camping gear, gardening tools etc  
• separate private areas for each occupant  
• main communal area that encourages communication and accommodates guests

1.6 %  
25.5 %  
9 %
Mid-century New Zealand case study strategies

1. Levels.

2. Innovative partitions.

3. Relationship with the outdoors.

Japanese Contemporary case study strategies

8. Levels.

9. Tall Volumes.

10. Interesting viewpoints.

Figure 73. Compilation of all mid-century New Zealand and Japanese contemporary case study strategies to be applied in the design of Patchwork House Investigation I.
4. Abundance of texture + colour/artistic features.
5. Furniture as room dividers.
7. Intriguing viewpoints/aspect.
8. Multi-use spaces.
10. Elements of surprise.
11. Double functioning surfaces.
12. The House Reformed
13. The Patchwork House
House 1.

Meg + Mark Molenberg

3. Relationship with the outdoors.

5. Furniture as room dividers.


11. Multi-use spaces.
Figure 74. Strategies used in the design of House 1

Figure 75. Plans and perspective drawings of Patchwork House I investigation’s house for a couple
House 2.

Terry, Tracy, Talulah + Tom Turnbull

2. Innovative partitions.

3. Relationship with the outdoors.

7. Intriguing viewpoints/aspect.


Figure 76. Strategies used in the design of House 2

Figure 77. Plans and perspective drawings of Patchwork House I investigation’s house for a young family
House 3.

Peggy, Paul, Prue + Patrick Pearson

8. Levels.

9. Tall Volumes.


10. Interesting viewpoints.
Figure 78. Strategies used in the design of House 3

Figure 79. Plans and perspective drawings of Patchwork House I investigation’s house for an adult family of four
House 4.

1. Levels.

2. Innovative partitions.

7. Intriguing viewpoints/aspects.

11. Multi-use spaces.

9. Tall Volumes.
Figure 80. Strategies used in the design of House 4

Figure 81. Plans and perspective drawings of Patchwork House I investigation’s house for a single occupant
House 5.

Sam + Shaun Sanders


3. Relationship with the outdoors.

9. Tall Volumes.

5. Furniture as room dividers.

Figure 82. Strategies used in the design of House 5

Figure 83. Plans and perspective drawings of Patchwork House investigation's house for a single parent and child

< Figure 82. Strategies used in the design of House 5
The following investigation seeks to trial new methods of room configuration, exploring what would happen if the house was dissected and then mashed backed together. Would joyful spaces be realised that could also function well?

This experiment was a literal mashing or jumbling of the five Patchwork House I designs into one house. The jumbling was constrained by the implementation of proven design considerations where living spaces are orientated to the north, and bedrooms are arranged on the upper levels.

This experiment revealed moments of intrigue where the angled rooms overlap, however the final result remained fairly conventional in layout.

The most notable flaw of this investigation is that the traditional ideas of rooms are still present and restrict flexibility and economy of space in the design process.

Figure 84. Elevations of the design outcome of Patchwork House II show an interesting exterior form.
Figure 85. A perspective view of the design outcome of Patchwork House II

Figure 86. Plans reveal the interesting junctions between angled and regular placement of rooms, however using the traditional convention of rooms restricts innovation in design and flexibility.

Scale: 0 4 8 m
Investigation Reflections.

Reflecting on the investigations in this chapter, some successful strategies have been identified and will be taken into future design tests. In particular are those identified in the analysis of the case studies. All of these strategies help to maximise Aesthetics of Joy and Economy of Space in house design. However, the application of these strategies in the house designs of the Patchwork House investigations I & II did not achieve a great sense of joy or efficiency, as it was revealed that retaining the traditional conventions of rooms restricted this. I have discovered that using these case study strategies alone is not enough to meet the aims of this thesis of establishing a successful design approach to the suburban house.

Figure 87. Collages from early research depicting modern families in dwellings compiled from mid-century New Zealand inspired design elements.
Having identified key strategies to maximise joy in the suburban house, this chapter focuses on establishing strategies for economy of space. These investigations are a direct response to the weaknesses identified in the previous ‘patchwork house’ experiments. Abandoning conventional house design and layout has proven difficult and therefore the following tests aim to break down the traditional ideas of rooms in order to rethink the domestic environment. "Rooms" are neglected and instead “activity spaces” are arranged in different combinations to form a reimagined house layout. The activity spaces are then assigned a title of either “rigid” or “fluid” space and this concept is tested through design case studies which respond to different lifestyle and site conditions.
Key aims of the Rigid x Fluid House investigations:
- To redefine interior space to maximise its efficiency
The first investigation looks at breaking down the conventional idea of rooms and forming entirely new modules which accommodate a range of activities rather than a singular function.

The Rooms of a house (‘Bedroom,’ ‘Living room,’ ‘Dining room,’ ‘Bathroom’ etc) were broken down into activity spaces (Eat, Cook, Sleep, Clean, Social, Dressing etc). These activity spaces were assigned a minimum volume needed in order to carry out the activity (see fig. 87). These volumes are sized to accommodate each activity with a small amount of circulation attached. For example “sleep(couple)” has a volume of 9m2, enough room to contain a queen sized bed and 1m access space around its perimeter.

These activity space volumes were then arranged in a series of test houses (A-G), exploring the possibilities of activity combinations. The combinations of activity spaces that were identified as the most successful were extracted in the aim of forming modules in which a house could be made up from. However when reflecting on the “modules” created it was noted that I ended up with a similar problem as before. That is, the modules were simply rooms with restrictive floor areas and specific functions, and did not optimise efficiency.
Figure 89. The house is broken down into a series of activity spaces to avoid designing with the conventional idea of rooms, these are assigned a specific floor area.
The activity volumes were explored in different combinations in experiments A - G. The volumes were aligned uniformly, then pushed and pulled to overlap, rotated onto one another and then stacked to form an element of verticality.
Figure 91. The design outcomes of experiments A - G were dissected into modules of different room configurations. Six modules were identified as the most successful for their combinations and interesting interior spatial qualities.
Figure 92. The six modules in plan and perspective.
Figure 93. The activity spaces are applied properties of rigid (black) and fluid (white) space.
Rigid x Fluid Investigation II.

Due to the restrictions of the module idea, the activity spaces were then revisited and looked at in terms of each possessing one of two properties - rigid space or fluid space. Rigid spaces (see fig. 92) would be designed as fixed units, as they required specific furniture or rigid plumbing requirements for their functions. The rest of the activity spaces are merged together in one volume of “fluid” space. ‘Rigid’ and ‘fluid’ spaces are visualised as ‘black’ and ‘white’ spaces in the design process in order to discard separate functions for each space.

The rigid units are designed as post and beam skeleton structures in which contain the required domestic equipment for each activity. The rigid modules vary in size in order to cater to the family scenarios they will be applied to and have a specific portion of fluid space applied to each. The outdoor space is included as a rigid module due to the importance of integrating the outdoor within the house layout, this allows for a minimum amount of outdoor space to be incorporated, as any space would.

The rigid and fluid concept was tested on specific family scenarios. Space requirements and specific needs were determined for each scenario and a specific amount of black and white space was assigned to each family based on the proportions of 25/75, proportions used by architects Coelacanth and Associates. Different layouts of black and white space within a volume were tested iteratively in order to use in the house designs. Combinations of a black core and white perimeter, black spaces dispersed amongst white, and stacked black spaces were explored.

The house designs that resulted translate as literal “rigid” and “fluid” space, and created some interesting unconventional designs. The exploration of the curve was a positive and overall I was pleased with the intriguing juxtaposition of curves and rigid units. The fluid space responds to the site conditions, as it moulds around trees within site boundaries. This also allowed better internal flexibility, however space efficiency was still a problem. The curves of the form meant a larger floor area was needed in order to fit conventional rectangular furniture into the spaces without creating awkward points of unusable space.

Figure 94. The 'rigid' structures and their corresponding floor areas, each is applied a certain portion of the fluid space.

A. Kitchen (small) = 11.2m²
B. Kitchen (big) = 15.1m²
C. Clean (small) = 6.9m²
D. Clean (big) = 9.5m²
E. Toilet = 3m²
F. Laundry = 3.8m²
G. Circulation/storage = 6.9m²
H. Storage = 1.8m²
I. Outdoor (small) = 6m²
J. Outdoor (big) = 8m²
Black / White Space Allocation.

Figure 95. The family formulas are based on the proportions - black space 25%, white space 75%.

Figure 96. Kazuhiro Kojima and Kazuko Akamatsu, partners in CAT (Coelacanth and Associates) approach house design with the principle of 10%/90% - Black/White space. "Black Spaces are designed for a specific use serving the users; White Spaces are designed for various uses, empowering the user." This has been adjusted realistically to the New Zealand context with the proportions of 25/75.

Family Formulas.

Figure 97. The rigid unit formulas for each family.

Figure 98. Next Page: Explorations of black and white space within the house volume.
House 1.

Meg + Mark Molenberg

Total Floor Area = 90m²

Black (rigid) space = 28.8m²
White (fluid) space = 61.2m²
Green (outdoor) space = 27m²

Figure 99. Design process of the rigid x fluid house 1
Compiling the rigid and fluid spaces

House 1 design outcome

Fluid x Rigid House
Figure 100. Plans of House 1 indicating how fluid and rigid space is organised to accommodate the lifestyles of a young couple.

Figure 101. An exterior perspective view of House 1.
House 2.

Peggy, Paul, Prue + Patrick Pearson

Total Floor Area = 135m²

Black (rigid) space = 44m²
White (fluid) space = 91m²
Green (outdoor) space = 40.5m²

Figure 102: Design process of the rigid x fluid house 2
Compiling the rigid and fluid spaces

House 2 design outcome
Figure 103. An exterior perspective view of House 2

Figure 104. Plans of House 2 indicating how fluid and rigid space is organised to accommodate the lifestyles of four adults.

The House Reformed
Fluid x Rigid House

1 Fluid Space
2 Outdoor Living
3 Kitchen
4 Bathroom
5 Laundry
6 Toilet
House 3.

Total Floor Area = 80m²
Black (rigid) space = 28.8m²
White (fluid) space = 51.2m²
Green (outdoor) space = 24m²

Figure 105. Design process of the rigid x fluid house 3
Compiling the rigid and fluid spaces

House 3 design outcome
Figure 106. Plans of House 3 indicating how fluid and rigid space is organised to accommodate the lifestyle of a single occupant.

Figure 107. An exterior perspective view of House 3.
House 4.

Sam + Shaun Sanders

Total Floor Area = 110m²
Black (rigid) space = 33.6m²
White (fluid) space = 76.4m²
Green (outdoor) space = 33m²

Figure 108. Design process of the rigid x fluid house 4
Compiling the rigid and fluid spaces

House 1 design outcome
Figure 109. Plans of House 4 indicating how fluid and rigid space is organised to accommodate the lifestyles of a single parent and child.

Figure 110. An exterior perspective view of House 4.
Stacked House Investigations.

This inefficiency of the curved form led to explorations of the three “stacked house” tests, in which the rigid and fluid concept was applied within a rectangular footprint, aiming to build ‘up’ rather than ‘out.’ These however, ended up as mini tower looking buildings and didn’t prove to be all that efficient either due to the inclusion of the restrictive rigid units.

Figure 11. Stacked House Abstracted
Figure 112. Perspective and exploded drawings of Stacked House 1. The doors on level one and two open right up to transform the floors into outdoor living in fine weather.
Stacked House 2.

Figure 113. Perspective and exploded drawings of Stacked House 2. The whole house is open, only divided by slight shifts in levels, another perspective on fluid space; occupants can communicate to others in any space of the house.
Stacked House 3.

Figure 114. Perspective and exploded drawings of Stacked House 3. The doors on the north, east and west faces of level 2 open right back to transform the central level into an outdoor living space.
Figure 115. Rigid x fluid abstracted

Figure 116. Stacked House abstracted
Investigation Reflections.

The house designs in Rigid x Fluid Investigation II meet the aims of maximising flexibility, by merging all fluid spaces into one large volume which allows the occupants to manipulate their domestic environment as they desire. As family situations change, e.g. children are born, old age starts to restrict mobility - the functions of the fluid spaces can be modified at will. Extra rooms can be added with the addition of adaptable partitions or living spaces can be transformed into bedrooms. Although the fluid space allows for greater flexibility, economy of space is compromised by the fixed size of the rigid units.

One of the key aspects identified in achieving aesthetics of joy is integrating the outdoor space into the internal layout. This was achieved very rigidly, as I made the outdoor spaces part of the rigid units in order to maintain a minimum outdoor area per house. The joy of the outdoor space was lost as they essentially became rectangular framed outdoor rooms, lacking any sense of surprise or organic form that I think the outdoors should possess.

Despite the curves of the building restricting furniture placement, they created interesting spaces both interior and exterior in contrast to the conventional fixed units. This injected unexpected moments of joy into the design.
The final chapter is a distillation of ideas and strategies from previous design investigations. The final design outcome successfully demonstrates the thesis aims of designing a suburban house that expresses qualities of joy and surprise whilst maximising economy of space. In doing so the research critiques the contemporary suburban house by presenting the benefits of a joyful alternative. Strategies developed in the previous tests that were identified as successful are collated, whilst the unsuccessful are identified and purposefully avoided.
Figure 117. A compilation of the design outcomes from the previous investigations
Identifying Successful strategies.

The following strategies have been identified as successful in achieving joy, surprise and economy of space in the design of the suburban house, and will be compiled in the research's final design outcome: the House Reformed.

**The Data House Investigations**
1. Integration of outdoor living spaces in the floor plan

**The Patchwork House Investigations**
1. Variation in open levels, allowing a space to accommodate multiple functions at once and occupants to communicate in unconventional ways
2. Maximising appreciation of the outdoors from the interior spaces
3. Abundance of texture and colour - create moments of joy and surprise
3. Design of viewpoints/aspect that create interesting lighting qualities and unconventional views for the occupant, both internally and externally
4. Tall volumes, giving the impression of greater space, allowing floor areas to be reduced
5. Innovative partitions that enable great flexibility of a space and act as an interesting design feature
6. Built in furniture and double functioning surfaces to optimise space efficiency
7. Inclusion of Multi-use spaces - a room with no intended function
8. Create elements of surprise and delight

**The Rigid x Fluid House Investigations**
1. Spaces that act as ‘fluid’ can respond to a wide range of functions and change as the occupants desire
2. Outdoor spaces should be fluid and organic, flexible to suit different weather conditions in order to elicit joy
3. Making spaces with small floor areas taller creates a greater sense of space for the occupant
1. Introduction

2. Analysis of Design Features
   2.1 Analysis of Design Features
   2.2 Analysis of Room Proximities
   2.3 Analysis of Room Sizes
   2.4 Analysis of Privacy Values
   2.5 System of Parts
   2.6 Partition Design
   2.7 Visualisation of Family Scenarios

3. Parametric Design Driven
   3.1 Scenarios Visualised Parametrically
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The House Reformed

A House Reformed
Figure 119: A series of conceptual sketches, testing out strategies on small suburban and urban sites.
A Site for the House Reformed.

The site for the final design was chosen for its challenging constraints. In order to push the boundaries of the suburban house, an urban site was chosen, sitting against a shared pedestrian and vehicle lane. The constraints of the site encourage innovative design thinking, challenging the conventions of the traditional suburban house consisting of a private detached house with a front and backyard. The grain of the urban site is very different to a typical suburban grain, with taller surrounding buildings and exposed views to the public.
The site is located in a popular urban lane, culturally rich in boutique food companies, bakeries, bars and cafes. It's public positioning adds an interesting constraint for meeting the aims of utilising the outdoors whilst maintaining suburban privacy.
The site and its sunlight properties over the course of a day during the autumnal equinox. The tall surrounding buildings restrict evening sun at ground level, another challenging constraint of the site.
Figure 125. Eva street and its surrounding buildings. The bottom two images feature the two existing buildings on site.
Figure 126. Site plan showing the position of the two existing buildings and the use of the surrounding public access lane.
The final design outcome; the House Reformed, is designed for the Chesters, a large family of five - 2 parents, 2 children and a grandparent.

The concept of breaking the house down into separate activity volumes is utilised. The size required for each spatial volume is determined to meet the needs of the family of five without an excessive use of space.

The central concept of the final design was to maximise the utility of the outdoor living space and integrate it into the layout of the internal spaces. Visual connection and access to the natural environment is a key strategy to create joy for occupants of a house.

The House Reformed is a ‘garden house,’ the whole site is transformed into a large outdoor living space, with its internal spaces dispersed around the site - the concept of the large standalone suburban house with a front and backyard is dissected and turned inside out.

Figure 127. The separate activity volumes of the House Reformed and their dimensions.
The traditional idea of a large standalone suburban house with a front and backyard is dissected and turned inside out.
Figure 129: The optimal layout of the house volumes on the site are explored through modelling with foam and paper, materials suited to the quick-analytical process.

A House Reform
Exploration of Aspect Design.

Figure 130. Cardboard modelling explores the design of interesting aspect and viewpoints for the separate volumes.
Modelling with foam and cardboard was used in the development stages of the House Reformed, suited to the quick explorative process of conceptual design.

The optimal layout of the house volumes on the site were explored using small foam models (see fig. 129). Once the most successful layout was established, design of the separate buildings was explored. Cardboard modelling was used in order to explore aspect and viewpoints, focusing on interesting manipulations of light in the interior spaces (see figs. 130, 131). Skylights were incorporated in the design of all volumes to optimise light from above, due to shading on the site from the tall surrounding buildings.

The cardboard models resulted in a design that resembled a miniture village with conventional roof lines, doors and windows (see figs. 130, 131). I decided that I needed to explore the design of the volumes with greater abstraction.

Foam was once again utilised for its rough modelling qualities and the apertures were restricted to just one per building. This was done with the aim of designing an exterior that was less recognisable as a house and more intriguing as a sculptural object in order to enhance whimsicality and maximise the building’s joy.

Figure 131. The resulting designs of the separate buildings using cardboard modelling.
Figure 132. Plan view of the abstracted model
Apertures are restricted to one per volume and the form of the buildings evolve as sculptural objects expressing whimsicality.
Figure 134. Four design iterations of form exploration focusing on the shape and angle of the apertures
3.

4.
Forming the Shifting Box.

Although the design of the singular aperture/light source produced interesting forms, it did not allow good connection between the interior spaces and the surrounding exterior environment. The final form of the buildings, the shifting box form, results from aiming to create an abstract building exterior that produces dynamic internal lighting qualities whilst allowing interesting views of the surrounding garden. The shifting form allows the occupant to experience the outdoors in unexpected ways, catching glimpses of the surrounding garden and sky, whilst maintaining a high level of privacy from the public lane surrounding the property.

“Tallness delivers a kind of generosity that bigness never can...our obsession with “building out” is very unsustainable, the mentality around this must be re-adjusted, we have to start exploring the interesting qualities height rather than width offers us.”

- Nat Cheshire

Lighting Qualities.

Figure 136. The formation of the shifting box

Figure 135. The shifting box form creates interesting interior lighting qualities throughout the course of the day
Aspect Qualities.

Figure 137. The shifting form allows the occupant to experience the exterior environment in unexpected ways, whilst maintaining a high level of privacy from the adjacent public lane.
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Figure 143. First floor plan of multi space

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Figure 145. A sectional perspective of multi space's lower floor; the space can be used for multiple functions - a study, kids room, extra bedroom or studio. Rich in texture, the green brick tiles and terracotta floor tiles create a sophisticated yet joyful space. Elevated from the ground that can be opened right up to enjoy the garden as an extension of the interior.
Figure 146. A sectional perspective of multi space's upper floor. Located at the front of the property the light angles into the tall volume and dances along the walls throughout the day, creating a contemplative and uplifting space. The upper platform promotes a quiet moment to read a book, private but open.
b. social.
Figure 149. Section perspective of the social space
Figure 150. A sectional perspective of the social space, looking out from the TV pit. The heart of the house, a central space for occupants to dwell in one another’s company. The sunken tv pit and elevated platform allow intimate moments within the bustling family room.
Figure 151. A sectional perspective of the social space. Large, heavy curtains act as flexible partitions, allowing kids to watch a movie in the TV pit whilst adults entertain in the central space; or transforming the upper platform into an extra bedroom if unexpected relatives come to stay. The space is soft, lined in native timber but accented with licks of colour instigating a smile as you enter the space.
Figure 152. Ground floor plan of the cook/eat space.
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Figure 155. A sectional perspective of the main eating space. Extreme verticality creates a mesmerizing atmosphere in the eating space. Light dances across the table, presenting unique moments to eat your breakfast.
d. sleep 1.

Figure 156. Ground floor plan of sleeping space 1
Figure 157. First floor plan of sleeping space 1

Scale:
0 1 2 m
Figure 158. Section perspective of sleeping space 1
Figure 159. A sectional perspective of sleeping space 1. Storage and flexibility is maximised, with the entire height of the west wall comprising a built-in storage unit. Items can be put on display, allowing the wall to act as a personal gallery space. Storage under the stairs offers opportunities to contain a messy room. A notable feature is the space's connecting the the room next door, multi space 2. The middle wall can be folded back to enlarge the space if desired.
Figure 160. Sectional Perspective of sleeping space 1’s upper level. The curvature of the upper platform adds a sense of whimsicality, its banister doubling as a large desk, creating an inspiring workspace. The shifting box form of the room allows glimpses of the greenery in the garden below and the sky above.
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Figure 167. Lower floor plan of sleeping space 3

Figure 168. Upper floor plan of sleeping space 3
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Evidence of Design Strategies in the House Reformed.

**Strategy** - Integration of outdoor living spaces in the floor plan

**Design Approach** - Emphasis is placed on outdoor living as the whole site is transformed into a garden with the separate internal spaces arranged throughout; these are connected by a winding pathway which follows the organic shape of the outdoor space.

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**Strategy** - Maximising appreciation of the outdoors from the interior spaces

**Design Approach** - Every building on the site is designed with a wall of bifold doors opening out onto the garden, allowing every volume to open up to and access the outdoors directly.
**Strategy** - Variation in open levels, allowing a space to accommodate multiple functions at once and occupants to communicate in unconventional ways.

**Design Approach** - Six of the eight volumes are designed with a variation in open levels. The social volume for example contains three separate spaces defined by a shift in levels, allowing family members to enjoy both individual and intimate moments of relaxation and more communal/social occasions.

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*Figure 173. Transverse section of the social space illustrating variation in levels*

*Figure 174. Transverse section of the multi space illustrating variation in levels*
**Strategy** - Design of viewpoints/aspect that create interesting lighting qualities and unconventional views for the occupant, both internally and externally.

**Design Approach** - The shifting box design creates a dynamic pattern of light throughout the course of the day. Each volume has a 500mm high strip of glazing at ground level allowing a view of the surrounding garden in every space. In some spaces which are partially underground such as the cook and social spaces, the glazing strip is at eye level, allowing a unique perspective of the outdoors.

**Figure 175.** The shifting box design creates dynamic lighting qualities and intriguing viewpoints to the garden.
Strategy - Tall volumes, giving the impression of greater space, allowing floor areas to be reduced.

Design Approach - Five of the eight volumes have ceiling heights of more than 6 metres. The eating space is 7.14m tall with a floor area of only 9m² creating a mesmerising space to eat in.
Strategy - Innovative partitions that enable great flexibility of a space and act as an interesting design feature.

Design Approach - Large curtain partitions feature in almost every building volume, allowing the spaces to adapt to different situations, spaces can be closed off to create a temporary sleeping space for visitors or allow children to watch TV while adults socialise in the same room. The colour and texture of the curtain adds an interesting design feature to the spaces.

Figure 177. Flexible curtain partitions in the social space.
**Strategy** - Built in furniture and double functioning surfaces to optimise space efficiency

**Design Approach** - Large floor to ceiling built in shelving units feature in the sleeping, social and multi spaces, allowing ample storage. Occupant’s can display their items and artwork creating an individualised environment, expressive of the occupant’s identity. Floor surfaces double as seating and benches with storage underneath, in the cook, clean and social spaces.
Strategy - Inclusion of multi-use spaces that have no intended function but can accommodate a multitude of different activities.

Strategy - Spaces that act as ‘fluid’ can accommodate a wide range of functions and change as the occupants desire.

Design Approach - Many spaces in the design can be adapted to suit different functions. A movable partition allows spaces d. and g. to transform - they can be separated into a yoga room and study, two separate bedrooms or a large bunk room for young kids.

Figure 181. Movable partitions and non specific furniture allow spaces d. and g. to combine or separate serving a multitude of functions.
Strategy - Create elements of surprise and delight.

Strategy - Outdoor spaces should be fluid and organic, flexible to suit different weather conditions in order to maximise its utility.

Design Approach - Interesting viewpoints inject elements of surprise, the ground level glazing strips allow unconventional views of the exterior, whilst the exterior curtain that shields the connecting pathway hides and reveals arbitrary moments of the garden as you move from building to building. These exterior curtains also allow occupants to manipulate the conditions of the outdoor spaces, creating sheltered pockets of outdoor space during unpleasant weather.

Figure 182. The exterior curtain hides and reveals arbitrary views of the garden.

Figure 183. The exterior curtain can be arranged to create more intimate, sheltered outdoor living areas.
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Design Discussion + Conclusion

Personal observations of the monotony of contemporary suburban housing led me to explore and compile a series of qualities and characteristics that constitute a well-designed suburban house - a house that enables its occupants to flourish and instigates moments of joy and surprise whilst maximising economy of space. In response to the monotony of suburban mass housing, it is intended that the strategies discovered can also be applied on a mass scale.

The research approached this through an investigative process, exploring design methods of both the digital and traditional. The context of the research is presented in Chapter Two. Alison and Peter Smithton’s ‘Criteria for Mass Housing’ is used to evaluate the current state of the contemporary suburban house. The analysis revealed that joy, surprise and economy of space were key elements lacking in the design of these houses.

The investigations of the Data House in Chapter Three explores the use of parametric design, through both an automated computer algorithm and a manual application of this concept. It was discovered that the formation of a responsive algorithm was too complex and that the use of such a systemised method was restrictive in achieving creative design and aesthetic features. These investigations however did explore successful integration of the outdoors into the floor plan. This was identified as a key strategy for maximising joy in the house.

The Patchwork House investigations of Chapter Four identified key successful strategies for achieving aesthetics of joy and economy of space through the analysis of mid-century New Zealand and Japanese contemporary case studies. These strategies were recorded using traditional design methods of sketching and collage and then applied to the context of the contemporary New Zealand suburban house through a series of five design tests. The designs were then dissected and jumbled back together in an attempt to explore a more whimsical outcome. These Patchwork House investigations revealed that retaining the traditional conventions of rooms restricted maximising joy and economy of space.

In response to these restrictions, the Rigid x Fluid House investigations of Chapter Five aimed to maximise efficiency of interior space by abandoning the traditional conventions of rooms. The house is explored as a series of activity spaces rather than rooms, and these were identified as possessing properties of either ‘rigid’ or ‘fluid’ space. This concept was tested through four house designs exploring curved floor plans, and three house designs emphasising verticality and minimal building footprints. These investigations provided successful strategies for achieving economy of space through flexibility and aesthetics of joy through the juxtaposition of fluid and rigid forms.

Discoveries made in the thesis investigations were collated in a final design outcome, the House Reformed. This house design demonstrates a successful compilation of the strategies identified in the research in achieving joy, surprise and economy of space in the suburban house. It reveals the benefits of approaching the design of the house with these ideas as intrinsic qualities. The most successful strategies used to achieve these aims were establishing a greater connection with the outdoors, providing flexible spaces through the use of innovative partitions and furniture and injecting unexpected aesthetic moments through the use of interesting texture and colour.
Discoveries in Methodology

The investigative nature of the thesis, and its process of discovery revealed some interesting insights into design method. The design investigations were all reactions to method. The tensions between utilising the computer and manual design methods led to a turbulent process. It was revealed early on in the design process that the rigidity of a computer controlled design restricted aesthetic and innovative design features. Intervention of human thought to design the more subtle qualities that are required to enhance joy and adapt to individual desires was imperative, and I found it difficult to achieve a balance between these two methods. Manual methods of sketching, collage and model making were increasingly utilised throughout the process and were key in articulating the final design outcome.

This research process presented a revelation in personal preference of design method. To push ideas to their creative boundaries I found the manual method is essential due to its malleability and immediate nature. Modelling with foam and cardboard was a key method utilised in the development stages of the House Reformed, suited to the quick explorative process of conceptual design. This was a successful method compared to the digitally controlled configurations of previous investigations, as the tangible aspect allowed me to experience the building volumes from all angles and observe the effect of different lighting conditions. Computer modelling software is then used to articulate my design ideas in three-dimensional form and presentation.

Limitations

The method constraints were a major limitation in the research outcome. The complexity of the computer algorithm restricted the exploration of an individualised suburban house on a mass scale. This was an aim set at the beginning of the research but could not be met as defining strategies for aesthetics of joy and economy of space were determined as the central focus and these could not be achieved using the algorithm method.

Economy of space was focused on maximising the utility of the built area in order to reduce site coverage. This was to encourage greater use of the exterior environment in suburban living. The final design achieved this with a total floor area of 110m², being only 21 percent of the total site area of 520m². Although successful in reducing the size of the built area, the final design was situated on a large site that allowed for a certain degree of flexibility that other sites may not be afforded. This is a possible limitation in terms of applying the design to the suburban context where site sizes are restricted.

Future Opportunities

The limitations of the research have presented opportunities for future exploration. Although the responsive digital algorithm was too complex to complete within the timeframe and scope of the thesis, it has great potential, and the final design outcome could be used as a base model for this. The House Reformed model that was designed to possess qualities of joy and economy of space could work well as a responsive model. The small footprint and separate volumes allows the design to be applied to smaller or larger sites in different configurations, to meet different site constraints.

Overall the research has produced a successful design outcome and provided interesting insights into design method. It is has explored a worthwhile issue on the lack of joy, surprise and economy of space in suburban housing and demonstrated the importance of such qualities.


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