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Institute of Technology

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Candidate's Declaration

Research Ethics Committee Approval Number: 1383440

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UNITeC
Salutogenic Design: Redesigning Hospital Waiting Space to Promote Health and Wellbeing

Explanatory Document

Kai Zhao
1383440

A Research Project submitted in partial fulfillment of the requirements for the degree of Master of Architecture (Professional)
Unitec Institute of Technology, 2015
Supervised by Tony Van Raat
I. Abstract

With the need of pursuing better health condition for the human body in every way, hospital design solutions have been examined and revised over and over from the past to the present. Emphasizing the significance of paying attention to health rather than to disease, Salutogenic design has been introduced in the last 40 years as a perspective of environmental impact on people in hospital settings from a psychosocial point of view. Terrible hospital experience have been happening everywhere not only because of insufficient material and staff but also because of the way of organizing non-treatment spaces like entrances, waiting lounges, corridors, gift shops, and so on.

Auckland City Hospital, as a typical complex general hospital located at Grafton, is chosen as the site of this project due to the lack of salutogenic concern in its design.

This project proposes that waiting spaces, as important parts of non-treatment space, can help improve health by the application of salutogenic design. The concept of "the sense of coherence" is explored by its three key components: comprehensibility, manageability, and meaningfulness. Design elements with the salutogenic effect are proposed and tested in various ways, and then they will be applied to Auckland City Hospital. This will not only create a healthy hospital environment, but also animate the Grafton community with an atmosphere of healing and wellness.

Although hospital waiting space is the focus of this project, it will also address more non-treatment types of space (circulation spaces, activity spaces, coffee spaces, and so on) rather than just the traditional definition of a waiting room.
II. Acknowledgements

First, I would like to thank my parents, who are always behind me in all my endeavours.

I also would like to thank my supervisor Tony Van Raat for his ful support and supervision. His wisdom and enthusiasm not only provide me with knowledge and ideas, but encourage me to face the challenges that I found hard to deal with. He made this project possible.

Thanks too to many of my friends who share information and discuss ideas with me, especially Yutong Song who talked me through many difficulties when I wanted to back off.

Special thanks to Daniel McNelis from Jasmax as well for his valuable critique and suggestions.
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IV. Introduction

1. Background of the Project

The term salutogenesis was created by Aaron Antonovsky, a professor of medical sociology, in the 1970s. The term is derived from a combination of Greek and Latin that is generally interpreted as "health origins". It describes a methodology of focusing on factors that improve overall human body conditions rather than those lead to disease. To be more specific, the "salutogenic model" is a study of the relation and interaction between health, stress, and psychological coping process. The theory of salutogenesis rejects the dichotomy model of western traditional medication separating health and illness as two subjects. He described that the relationship of them should be a continuous variable, he called it "health-ease versus dis-ease continuum".\(^1\) (Refer to Figure 2)

In Antonovsky’s theory, the “sense of coherence” explains a central concept for the status of stress in human body functioning. He argued that salutogenesis is gained by experiencing a strong sense of coherence to predict positive health outcomes.\(^2\)

In his formulation, the sense of coherence has three components: comprehensibility, manageability, and meaningfulness.\(^3\)

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2. Ibid., 123
3. Aaron Antonovsky, *Unravelling the Mystery of Health* (San Francisco: Jossey-Bass Publishers, 1987), 16
Along with the development of a theory of health, architectural practice has been influenced by industrialisation for decades. The normal function of a hospital is treating illness but there are many examples of hospital facilities that neglect patients’ psychological, social and spiritual needs.\[4\] As an important space to circulate, connect, relax, and wait, hospital waiting spaces are playing a more and more important role in humanizing the hospital and promoting positive health conditions by reducing the stress of being in a hospital and creating psychologically supportive non-treatment spaces.

The aim of salutogenic design is to create an environment that stimulates the mind in order to create pleasure, creativity, satisfaction and enjoyment. In brief, salutogenic design aims to build things that make people healthier and happier.

As an internationally competitive city, Auckland has been assessed as offering a high quality of life by international standards.\[5\] However, affected by the residual influence of global industrialization, current hospitals in the region of Auckland lack a humanization approach. For example, the conditions of the largest hospital in Auckland, Auckland City Hospital and its supporting buildings, have been subject to complaint by users. The industrial looking facades, lack of natural light and green elements, confusing circulation and layout and depressing atmosphere have all showed an urgent need for special salutogenic intervention.

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4 Alan Dilani, “Psychosocially supportive design: A salutogenic approach to the design of the physical environment,” *Design and Health Scientific Review*, 1(2), 47-55

2. Project Outline

The project is an innovation and re-creation of general waiting spaces within an existing healthcare facility to promote both the physical and psychological wellbeing of patients and staff as well as to fulfill functional needs through the use of salutogenic design. Structural elements will remain and be re-utilized. Walls, floors, windows and other non-structural elements will be removed or re-designed to achieve a salutogenic purpose.

Technically, a waiting space is a room where people sit or stand until the event which they are waiting for happens and begins. In this project, the scope of waiting space is enlarged: it includes not only the space where people are waiting but also other non-treatment spaces like courtyard, roof void, and some of the circulation space that provide waiting in a way.

Due to its current conditions and recent construction, the primary choice of the site has been confirmed to be inside the Auckland City Hospital main building which was designed by Jasmax in the late 1990s, located on Park Road, in the Grafton suburb, east of the Central City of Auckland. (Refer to Figure 3)
3. Aims of the Project

Why have many modern hospitals failed to create spaces that patients like? Why are many healthy people apparently reluctant to visit hospitals? Why are hospital waiting spaces organized only by functional requirements?

A hospital is supposed to be a place for healing. However, modern clinical practice has a narrow view of healing by mainly focusing on treating illness while often neglecting patients’ psychological needs. The physical environment in a hospital space should not only treat diseases but also improve mental wellness by reducing anxiety and promoting positive psychological emotions. The application of salutogenic principles in hospital waiting spaces aims to achieve these as much as possible.

Specifically the objectives of this project include the following:

- To eliminate potential stresses in the physical environment of waiting spaces. To focus on those elements that make people more resilient as they face stress in hospital environment.
- To identify a more functional method of organizing hospital space. To find out salutogenic solutions to hospital waiting space.
- To apply salutogenic design to different functions and different scales in hospital transitional spaces. Eventually to enhance human wellbeing and prevent diseases.

6 Alan Dilani, “Psychosocially supportive design: A salutogenic approach to the design of the physical environment,” Design and Health Scientific Review, 1(2), 47-55
4. Research Question
How can hospital waiting spaces promote both the physical and psychological health of people by using salutogenic spatial intervention?

Sub-questions:
• What is the mechanism of salutogenesis to reduce people’s stress, help them cope, and promote health?
• What are the factors of hospital waiting spaces that could influence people’s physical and psychological activities and wellbeing?
• How can we apply salutogenic design to hospital waiting spaces or even larger scale facilities?

5. Scope and Limitations
This project explores the idea of salutogenic design as well as a way of organizing hospital waiting spaces.

Firstly, the principles of salutogenesis and salutogenic design will be identified by literature research and experimental survey. Originally salutogenesis is a theory explaining the mechanism of human health conditions; it could be utilized in many types of spaces including hospital waiting spaces.

Secondly, the conditions of existing building will be identified, questioned, and analyzed. There are
two main aspects in this: analyzing the waiting spaces and their connected spaces with a view of physical functions, and re-creating waiting spaces and some of the other transitional spaces from with view of salutogenesis.

Thirdly, the application of salutogenic design will be implemented in more transitional spaces in different functions and at different scales to form a whole healing atmosphere to promote the health and wellbeing of the users.

This project has certain limitations. It proposes an innovative organization and re-creation of general waiting spaces and of some other transitional spaces with the use of an existing structural system. The size and scale of the re-creations will be relatively large above the first three levels of the existing building, including circulation areas, general waiting spaces, general wards, some of doctors’ rooms and administrative offices. Existing walls, floors, windows and other elements will be removed or re-designed to achieve the salutogenic purpose. The overall building form will largely change by organizing spaces in order to achieve salutogenesis. However the project will not re-create every detail of the whole building. Detailed design will focus on a certain hospital department and will not touch on highly complex spaces like operating theatres, specialists’ rooms etc.

Because salutogenesis is largely concerned with psychological effects on people, it sometimes can be hardly measured. However it can be judged by empirical experience from the final outcome.
6. State of Knowledge in the Field

There are many books, articles, and reports on salutogenic design. The following people are those who have achieved prominence in this field.

• **Alan Dilani - Psychosocially Supportive Design**

Dr Dilani has been engaged in several universities worldwide in the field of design and health developing "Psychosocially Supportive Design Program", both in medical and design institutions.

In his article "Psychosocially supportive design: A Salutogenic Approach to the Design of the Physical Environment", he believed that the salutogenic approach provides a basic theoretical framework for psychosocially supportive design, which can promote health and wellbeing. Psychosocially supportive design should incorporate and consider factors such as access to symbolic and spiritual elements; access to art; good lighting; attractive space for social interactions; private spaces; and interior environment that provides positive experiences. Other factors include visual and physical access to nature, and personal control over, for example, lighting, daylight, sound, and indoor sense of coherence, thereby enhancing patients' coping strategies and health.^[7]

• **Jan Alexander Golembiewski - Start Making Sense**

Jan Alexander Golembiewski is a Ph.D. research student at the Faculty of Architecture, Design and

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Planning, University of Sydney. He is a leading researcher on the environmental factors that erode or contribute to good mental health outcomes.

In his research, he explains that there are many things that can be done with the architecture of a facility that may alleviate mental symptoms, lessen the likelihood of future psychotic episodes, alleviate stress and assist with basic cognitive functions. These innovations can be broken down into three categories in an architectural extrapolation of salutogenic theory, designing to foster a sense of coherence by comprehensibility, manageability, and meaningfulness. They all come together to create an architecture that really serves the needs of mental health patients, fortifying their overall sense of coherence and mental wellbeing and improving recovery.[8] His studies show the sense of coherence may be eroded by physical environment and, in turn, cause weak resistance to disease and intensive anxiety.

- **Roger S. Ulrich – Effects of Interior Design on Wellness**

Dr. Ulrich is Professor of Architecture at Chalmers University of Technology in Sweden. He is the most frequently cited researcher internationally in evidence-based healthcare design.

Ulrich uses stress as a starting point to measure how design affects healthcare outcomes in a traditional design setting. According to him, the design of traditional healthcare facilities actually

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worsens the manifestations of stress, rather than mitigate them. His study focuses on three supportive design principles: "design that fosters a sense of control with respect to physical surroundings; design that facilitates access to social support; and design that provides access to positive distractions." He identified some basic guidelines that can be utilized to meet specific needs to help the designer’s creativity and provide a direction to stress-reducing design.

Ulrich also focuses on an etiological concept - "stress", which surely provides valuable considerations, but it lacks the integrative view that is key to discuss salutogenesis.

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7. Methodology

The processes used in this project involve designing on the basis of existing knowledge and site conditions, analyzing the design solutions generated from research, testing them in both digital and hand-made models, then applying them to the site and analyzing the outcome.

Digital models and drawings will be used to analyse and demonstrate design concepts. At the same time, physical models will be an intuitive way to test the outcomes of each design process. An experimental survey will be carried out to get some empirical understanding of the design.

Basically, it will be a repetitive cycle of these processes during this project: analyzing the site, identifying the defects, considering salutogenic solution, testing outcomes in models or drawings, developing alternative solutions, applying them to the site and analyzing the final outcome by salutogenic standards.
V. Context Research

1. Hospital Developments in History

As a place the sick have been cared for, “healing space” has been transformed from home to the church, and came to what we now view as the hospital.

In many ancient cultures, religion and medicine were connected. In ancient Greece, Asclepieia, temples dedicated to the healer-god Asclepius, functioned as centres of medical advice, prognosis, and healing. (Figure 4) In the Roman Empire, buildings were constructed to take care of sick slaves, gladiators, and soldiers around 100 B.C., and later the Catholic Church became the most influential provider of health care in Europe. Also, some of the sick were cared for by monastics. In many affluent cities in Europe, hospitals started to change its role from religious places to civic enterprises. Although religious groups were still taking control of them, they kept a distinctly different civic character within
the community. Many of those buildings were structured around large central courtyards with smaller secondary courtyards delineated by the wards.

Many of those hospitals were constructed like the layouts of schools within the urban landscape, and the form of urban hospital landscape remained to be the dominant building form through the 19th century. For example, Westminster Hospital in 1862 (Figure 5), Guy’s and St Thomas’ Hospital in 1833 (Figure 6).

In the late 1700’s, Louis XV started a big revision of the hospital building form in Paris, he organised a committee and charged them with the responsibilities of creating fundamental standards for the hospital building typology during the time of reform. This sea change was partially evoked by the new discovery of the benefits of clean air and sanitary conditions as critical elements of health, especially within the hospitals. It had been well believed by the reformers that, instead of by receiving medical treatment, better health conditions can be achieved by natural, clean environment that provided good air quality. As a result of this reform, two architectural typologies were well responded, namely, a radial typology and a pavilion typology. The pavilion typology became a more influential form in later development. An example of the radial solution is the New Hôtel-Dieu in Paris in 1785 (Figure 7). Similarly, an example of the pavilion solution is The Royal Herbert Hospital in London in 1865 (Figure 8).
Florence Nightingale, who was a very influential figure in nursing following the Crimean war in 1854, was lauded for her intuitive, observational approach. This involves creating a healing environment for patients which not only looked at the physical surroundings, but also looked at their social welfare. She focused on providing patients with access to natural light, air, landscape, attention to diet, as well as a clean sanitary environment. Between 1861 and 1865, St. Thomas’s Hospital in London was built under the influence of Nightingale’s principles (Figure 9). The interior planning of this hospital reflects the pavilion configuration, which includes a primary corridor for supply and circulation, and thin plan of patient wards that extend off of this linear spine. This typology allowed light and fresh air to penetrate and created garden views between the building “fingers”. Nightingale’s principles influenced hospital design over the next hundred years.

After World War II, the booming number of the injured and sick required urgent development of hospital space. The efficiency of the hospital took priority over Nightingale’s principles of hospitals with fresh air, light, and views of nature. As a result, the form of the hospital largely changed, with more hospitals built as a “podium on a platform” typology rather than pavilion style. A typical configuration became a deep plan, multi-floor block with a patient tower placed on
With the development of better medical diagnosis and treatment facilities, the buildings have grown bigger and taller. Fresh air and natural light were barely accessed, and the hospital was seen as an efficient working machine.

A reexamination of this typology has been started over the recent years to re-gain access the to natural light and view, as emphasized in Nightingale’s earlier concept.

Fig. 10: Developments of hospital form
2. Literature Research of Psychiatric Facilities

Salutogenic design is most concerned with the psychosocial effects on a person in certain physical environments. As a psychology-involved typology of a hospital, a psychiatric facility should pay much attention to salutogensis. Even though this project is not to design a psychiatric hospital, research regarding this will be of great benefit to the later process.

Published in 1959 by WHO, *Psychiatric Service and Architecture* had identified the key factors of the hospital physical environment that should be well considered during the design process.\(^\text{[10]}\) The factors include daylight, colour, artificial lighting, noise, heating, and ventilation which are still looked on as critical variables by architectural practice today.

- **Light**

It has been well proven that daylight, both natural light and artificial light, can promote health significantly for people in general conditions, and it works on mental health patients as well. There has been research suggesting that natural light or artificial light with relatively high brightness could be beneficial to treatment of mental illnesses, like depression and agitation. They could also reduce the duration of inpatient stay for patients who have bipolar seasonal affective disorder or dementia. Moreover, it has been found out that exposure to light in the morning has shown more positive effects than exposure to light in the evening in the studies of depression.\(^\text{[11]}\)


patients has been proven a relatively inexpensive approach that has been used to gain consistently positive results. To utilize light as a significant contribution to patient wellbeing, the layout of patient rooms should face east to allow morning daylight to come through, while manipulating artificial light during the design process.

• Colour

The colour blue has been shown to be the most effective in making people feel peaceful and tranquil.[12] Blue streetlights have been used to prevent suicides and street crime.[13] Studies have shown that brighter colours demonstrate a less arousing outcome and a less irritating effect than darker colours.[14] Some studies of wall colour choice have suggested that monochromatic, bland colour schemes and fashionable pastels should be avoided. Brighter colours may be preferred for patients with depression and some older adults, but they could be over-stimulating for highly agitated patients. Warm blue tones often have a soothing or sedating effect, presumably because of their shorter wavelengths, and they may be particularly suitable for the calmest areas. Closely related colours of the same hue and intensity also have a calming effect. Blue-green colours can have a negative effect on mood for patients with depression and less energy.[15]

Moreover, the benefit of careful colour selection is much more than the calming effect. Colour coding system can greatly help patients identify orientation and can be used as a part of the way-finding process.

- **Access to Nature**

Scientific evidence has indicated that human activities in the natural environment can bring about more positive outcomes to human than those in a non-natural setting. Based on a study by Diana E Bowler, Lisette M Buyung-Ali, Teri M Knight and Andrew S Pullin, they conclude, “our review identified 25 relevant studies, which measured a wide range of different health or well-being outcome measures. Meta-analysis of data from different studies on self-reported emotions provides evidence of a positive health benefit. This is manifest as lower negative emotions, such as anger and sadness, after exposure to a natural environment in comparison to a more synthetic environment.”[16]

Many newly-designed psychiatric facilities have been focusing on the visual and physical relation between nature and patient. A large number of researches concerned with the effect of nature have been repeatedly confirming the fact that viewing nature could lead to positive emotional and physiological changes by affecting blood pressure and heart activity.[17] The natural element in facilities could also be beneficial to staff. Green gardens in the workplace can decrease stress levels

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and boost efficiency by promoting social connection and offering people great opportunities to temporarily escape from intense working environments.

• **Interior Design**

Planning for interior design should take into account the unit’s symbolic meaning or a part of the messages that the environment sends to its occupants. Importantly, treatment quality and positive expectations of patients and staff can be reinforced by interior design. The importance of reducing the feeling that they are inside an institution and introducing a home-like environment is consistently emphasized in many researches. Both patients and staff can benefit from a healing atmosphere which promotes good emotions and improved well-being. Research has revealed that people prefer familiar rooms over decorative or stylish rooms.\(^{18}\) Upholstered furniture should be included whenever feasible.

• **Social Interaction**

Positive social interaction with friends and family has been found to be an important aspect in many medical programs, and study concerned with accommodating visitors indicates that single rooms predict distinctly better outcomes than multi-bed rooms. Family presence is significantly reduced because it violates privacy and restricts the time of visiting in multi-bed rooms situations.\(^{19}\) It has been recommended that there should be spaces in which patients can relax and retreat, including

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those where they can conduct social activities. Overcrowding of spaces should be avoided. Privacy may increase environmental satisfaction and attachment to place. Day rooms should be open and flexible and encourage interactions with staff, while also allowing for personal autonomy. There is some evidence that small-group circular arrangement of furniture may promote socialization.\textsuperscript{[20]}

- **Environmental Stressors**

Omnipresent stressors can be critical factors that change people’s psychological status, particularly in hospital environments. In order to achieve effective recovery in psychiatric facilities, stressors like noise, glare, and smell etc. must be seriously considered during the design process of the healthcare facility.

Scientific evidence has shown that noise is one of the major causes of sleep disturbance. It indicates that noise induces high stress level in hospital environment, increases blood pressure and accelerates heart rates of patients. This effect is particularly outstanding in rooms that have more than two beds, in which noise is created by other patients, visitors, and staff.\textsuperscript{[21]} The problem with multiple-patient rooms is more complicated than just the noise, it is also concerned with the social benefits and the management of surveillance. Therefore the design approach would minimize the effects of noise in different ways in spite of bedroom configuration.


Although natural light has been found beneficial to the healing process, the existence of inappropriate light like glare is very likely to cause unnecessary stress and discomfort.

Smell or poor air quality as another significant stressor could also have a negative impact on people. Researches, particularly of air quality in psychiatric hospital interior space, have not been well studied, but empirically speaking, poor air quality would not be attractive to patients who have asthma or respiratory allergies. It would also very likely cause depression and stress.

Another variable that can be a significant stressor is the way-finding process in a hospital environment. It is a critical element for both patients and visitors. Researchers found that, in a hospital setting, patients who were provided with orientation assistances at the begining were more self-reliant and showed fewer demands of aids from the staff than uninformed patients, who think their condition as worse and were often found to have accelerated heart rates. This outcome was supported by a research in a hospital in United States that spent a significant amount of time and fund in direction-assistance by staff, which was an estimated 4500 working hours, approximately equivalent to two full-time positions.\[22\]

Scientific evidence has also shown that artwork can be used to create a calm atmosphere,\[23\] and artwork should be an integral part of hospital design, as most of the patients can respond positively to artwork depicting nature.\[24\] However, inappropriate artwork, like chaotic abstract art, can cause stress and aggravate other conditions.

VI. Literature Reviews

1. Health, Stress, and Coping

In his book *Health, Stress, and Coping*, Aaron Antonovsky uses the term “salutogenesis” to describe an approach focusing on factors that support human health and well-being rather than on factors that cause disease. The central concept of this book is that every person has a pervasive, enduring, and dynamic feeling of confidence that things are predictable: they can be reasonably expected and they will be very likely to work out. The origin of health is highly connected with that feeling, which he defined as Sense of Coherence (SOC).

Antonosky rejected the traditional medical model of pathogenesis which is the dichotomy of patient and non-patient. He notes three reasons why the question of pathogenesis is inadequate: "it blinds us to the subjective interpretation of the state of affairs of the person; it pushes in the direction of the single disease and single bullet; it postulates a dichotomous, qualitative distinction between a state of disease and a state of non-disease."[^25]

The human body has systems of homeostasis-maintaining and homeostasis-restoring. In the course of living, stressors are constantly encountered, thus, expenditures of energy are required to keep ourselves on an even keel. Antonosky argues that the difference between a stressor and other types of stimuli is a matter of degree. A stressor can be defined as a demand made by the internal or external

environment of an organism that upsets its homeostasis, restoration of which depends on a non-automatic and not readily available energy-expending action.[26]

Tension is aroused by stressors. At the same time, tension management determines whether a person in tension will be pushed in one direction or the other on the health-ease/dis-ease continuum. Antonosky defines that GRR (generalized resistance resource) is the most general characteristic of a person, a group, or the environment that can facilitate effective tension management.[27] The sense of coherence is primarily determined by GRR which is categorized into five types: Artifactual-material GRRs, Cognitive and emotional GRRs, Valuative-attitudinal GRRs, Interpersonal-relational GRRs, and Macrosociocultural GRRs.[28]

2. Unraveling the Mystery of Health

In another book written by Antonosky, *Unraveling the Mystery of Health*, he further explains the concept of SOC by answering how one’s GRRs can be built up to promote strong SOC as well as how SOC connects to health.

Antonosky did interviews with a wide variety of persons who had two characteristics in common, namely, they experienced major trauma, and they were reported to be coping amazingly well. He found out three core components of SOC: comprehensibility, manageability, and meaningfulness.

26 Ibid., 71
27 Ibid., 96-99
28 Ibid., 117
They are defined in the table below:[29]

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<th>Sense of Coherence Components</th>
<th>Definition of Each Component</th>
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<tr>
<td>Comprehensibility</td>
<td>&quot;The extent to which one perceives the stimuli that confront one, deriving from the internal and external environments, as making cognitive sense, as information that is ordered, consistent, structured, and clear, rather than as noise-chaotic, disordered, random, accidental, inexplicable.&quot;</td>
</tr>
<tr>
<td>Manageability</td>
<td>&quot;The extent to which one perceives that resources are at one’s disposal (refer to resources under one’s own control or to refer to resources controlled by legitimate others—one’s spouse, friends, colleagues, God, history, the party leader, a physician-whom one feels one can count on, whom one trusts.) which are adequate to meet the demands posed by the stimuli that bombard one.&quot;</td>
</tr>
<tr>
<td>Meaningfulness</td>
<td>&quot;The extent to which one feels that life makes sense emotionally, that at least some of the problems and demands posed by living are worth investing energy in, are worthy of commitment and engagement, are challenges that are “welcome” rather than burdens that one would much rather do without.&quot;</td>
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</tbody>
</table>

He defines stressors as generalized resistance deficit. They bring in their wake a variety of unpredictable experiences. Inevitably, they result in a significant weakening of one’s sense of coherence. Moreover, the absence of some GRRs can become a stressor.\(^{30}\)

He also mentions that some events in the experience of life can be stressors, like the death of a family member, divorce, being fired from work, the addition of a new family member, retirement and so on. They are called “stressor life events”. He said what is important about such an event is not the event itself but the many consequences to which it gives rise. They and the chains of events that follow in their wake produce tension. It is the strength of the SOC of the person experiencing such events that will determine whether the outcomes will be noxious, neutral, or salutary.\(^{31}\)

Antonosky states that child-rearing and cultural patterns of social organization could build up GRRs which result in strong sense of coherence by increasing the three components. He also said that “the sense of coherence develops over the lifespan; childhood, adolescent, and early adult experiences with moratoria and maturational growth, without full responsibility for one’s own life, may have been adequate to achieve a moderate SOC.”\(^{32}\) On the other hand, strong SOC would transform some of the stimuli into non-stressors automatically, so one will not experience tension in many cases. He developed a questionnaire to calculate a person’s sense of coherence in the appendix of his book which provides a valuable reference for the later survey.

\(^{30}\) Ibid., 28
\(^{31}\) Ibid., 29
\(^{32}\) Ibid., 122
3. Psychosocially Supportive Design

Alan Dilani has been applying Antonovsky’s theory of salutogenesis to the built environment for years, specifically to the design of hospitals. He further explores the SOC concept, looking at his approach of achieving salutogenic purpose as psychosocially supportive design.

In his article "Psychosocially Supportive Design: A Salutogenic Approach to the Design of the Physical Environment", he said, "the salutogenic approach provides a basic theoretical framework for psychosocially supportive design, which can promote health and wellbeing. Psychosocially supportive design should incorporate and consider factors such as access to symbolic and spiritual elements; access to art; good lighting; attractive space for social interactions; private spaces; and an interior environment that provides positive experiences." He analyzes some key elements in hospital environments, such as crowding, nature, daylight, colour, music, and art, and concludes that investments and changes within the physical environment could lead to profits through an increase in health conditions and productivity.

In another article of his, "Psychosocially Supportive Design- As a Theory and Model to Promote Health," Alan Dilani shifts his approach from the pathogenic to the salutogenic. He states that the basic function of psychosocially supportive design is to start a mental process that, by attracting a person’s attention, may eliminate or, at least, reduce anxiety, bringing about positive psychological

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33 Alan Dilani, "Psychosocially supportive design: A salutogenic approach to the design of the physical environment," Design and Health Scientific Review, 1(2), 47-55
changes. Design from a salutogenetic perspective defines, not only the causes of stress, but introduces wellness factors that strengthen health processes.\[^{34}\]

He also argues that the salutogenic design should be a collective work which involves stakeholders, designers, developers, doctors, staff and maybe patients and their families. Designers could support this effort by quantifying the benefits of such an approach. At the same time, the organization should measure the sense of coherence and the staff should comprehend it and act on it.\[^{35}\] The following table is Alan Dilani’s design elements in relation to sense of coherence, extracted from Design& Health China 2014 PowerPoint.\[^{36}\]

<table>
<thead>
<tr>
<th>Sense of Coherence Components</th>
<th>Design Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensibility</td>
<td>Way-finding, colours, nature, preception, landmarks, pleasure</td>
</tr>
<tr>
<td>Manageability</td>
<td>Aesthetic elements, natural light, green environments, stimuli, interior, restoration, ergonomic</td>
</tr>
<tr>
<td>Meaningfulness</td>
<td>Social support, music, art, culture, pets, gyms, views, comfort, positive distractions</td>
</tr>
</tbody>
</table>
VII. Precedent Reviews

1. UJA Federation Community Complex

Located in Vaughan, Ontario, Canada, the Community Complex was commissioned by the UJA Federation of Greater Toronto, designed by the Canadian architectural firm ARK. It has been highly commended as the International Salutogenic Design by the International Academy for Design & Health. It also won the Award for International Interior Design. (Figure 11)

After it was completed and opened in the autumn of 2012, a broad range of community-based services, such as healthcare and fitness, sports and recreation, culture and arts, have been included into the complex, with the aim of uniting and creating more positive interaction and synergies in the community between these different types of services. The design from ARK achieved the goal by consolidating these various agencies inside a highly transparent 34,000 sq. meters, three-storey complex which was combined by four building masses via a pedestrian streetscape. (Figure 12)

The primary concept of the design comes from the desire that the people in the community can be supported from early childhood to old age and the requirement to create a complex that brings people together despite gender, abilities, ethnic matters, and social background.
ARK achieved this by partnering services (childcare with fitness classes, Mount Sinai Hospital clinical health care with swimming, language classes with art studios, etc.) and creating a high degree of transparency inside the buildings. (Figure 13)

This complex inspires me by the usage of a pedestrian streetscape and the proper use of transparent glass. The pedestrian space works as an entrance. It also lowers the stress levels by connecting to other functions. The glass breaks the visual separation between parts and connects people to the outdoor natural environment. Sufficient view penetration really lightens the atmosphere and increases the sense of coherence.

2. Zucker Hillside Behavioral Health Facility
Designed by Array Architects, the new Behavioral Health Pavilion has completed in 2012. Instead of having an institutional design concept common in many other psychiatric hospitals, the architects decided to make the design atypical and unique as a behavioral health facility by differing from the institutional look of many other psychiatric facilities. Located in the heart of an academic medical center in New York,
the front of the building incorporates a glass curtain wall with a vine-covered truss system to create a sustainable “green wall” (refer to Figure 14), as well as access to nature and garden spaces that functions as a respite space for the staff. Located at grade, the activity courtyards are very convenient to promote interaction and socialization for the patients. The remainder of the building is clad in a fiber cement rain screen system in different colors, giving the building a striking profile on the campus.

The public zone includes a two-story light-filled rotunda at the entrance, (refer to Figure 15) which serves as a waiting area in which visitors can chat or grab a snack at the cafe. With views to nature and comfortable furniture, visitors can take a restful break. The rotunda also serves as a lounge space for students and teaching staff to meet and converse, which promotes the educational aspects of the institution. (Refer to Figure 16)

Distinct large-scale artwork serves as a way-finding device at key entry portals, complemented by soothing colors and materials that were selected in concert with the local vernacular, again reinforcing an environment that is familiar and recognizable (refer to Figure 17). Maximal views to nature and natural light were carefully achieved for patients in many areas.
The way art was used at the entrance, as well as colour as device, and vine-covered truss really increase the overall sense of coherence for the patients and other people as well.

3. Healthcare Centre for Cancer Patients

Completed in 2012, the new Healthcare Center for Cancer Patients in Copenhagen, Denmark designed by Nord Architects aims to be just a place where you come to get better, get knowledge, and have fun, rather than having a cancer treatment hospital. (Figure 18)

The healthcare building is iconic and creates an awareness of cancer without stigmatizing the patients. It is a contradiction in terms in many ways, but Nord Architects settled the argument by creating a series of smaller-scale buildings shaped like traditional houses. Then they connected the houses by a raised folded roof shaped like the Japanese paper art origami (refer to Figure 19). In that way the building creates iconic landmark which has plenty of space without losing a comforting human-scale for the individual.
Like medieval monasteries the healthcare center has an inner courtyard where you sit in silence and meditate (refer to Figure 20). There are many other activities offered in the building such as climbing and training. Other activities include patient groups, psychologists, groups for relatives and advice groups run by the Danish Cancer Society.
VIII. The Site Context

Grafton is a suburb of Auckland City which have existed from the early history of the city. It was once known as “Grafton Heights” when the medical university started there. In the 2006 census, 1,014 people usually live in Grafton East, 52 2,247 people usually live in Grafton West. There are many historic buildings, constructions and landmarks from the early 20th century that characterize the Grafton area (landmark locations refer to Figure 28), like the Grafton Bridge, Basley-Bush House, the Auckland Medical School buildings, Ernest Adams House, Grafton Hall of Residence, Huntly House, La Roche Villa, the Auckland Domain, Outhwaite Park and so on. These local landmarks indicate a cultural setting and help patients and visitors improve their sense of meaningfulness, which then enhance the overall sense of coherence.

Fig. 28: Location of landmarks in Grafton

Fig. 25: Auckland Medical School

Fig. 26: Huntly House

Fig. 27: La Roche Villa
Generally speaking, the area of Grafton is quite large for such a small population. However, the social developments of this area have largely changed the living environment. “Lovely old deco apartments taken down for leaky buildings… When they extended the road and developed the hospital it practically killed the village because of the constant roadworks. The hospital sucked out a lot of life when they put shops in there. There used to be a fantastically eccentric green-grocer, the lady was there forever, but now it's a chemist.” Caitlin Smith said to the reporter. Hospital and roads are supposed to bring health and convenience into this area. However many of them have failed to achieve that. Therefore, another aim of this project is to bring salutogenesis into the local environment by improving user experience and create healing atmosphere for the Grafton neighbourhood.

Located in the centre of Grafton, Auckland City Hospital serves a population of around 444,100, seeing almost two million patients annually. According to the Auckland DHB data, Auckland DHB serves over 468,000 people with a projected growth of 19 per cent or 86,000 more people by 2026. Among this population, 52% of them is Pekeha, 29% Asian, 11% Pacific, 8% Maori, and 2% is other ethnics. The hospital is influenced by the mixed culture of the Pacific, traditional Maori, Asia, and Europe. The following figures are ethnic group percentages in the Auckland and Grafton area. (Figure 32)
1. Auckland City Hospital Building History

The site of this project is the existing hospital facility of Auckland City Hospital main building, which is number 32 on the map. (Refer to Figure 33)

During 1846 to 1877, the site of the current Auckland City Hospital was occupied by a timber hospital originally which provided four patient wards, totally 40 beds. The architect of it was called Frederick Thatcher who also designed the St. Mary's Church as well in Parnell. Both Europeans and Māori were treated in the hospital for quite different diseases they had. The effects of excessive alcohol consumption was the most problem among the Europeans in hospital treatment while the Māori was mostly treated for tuberculosis and rheuma at that time.

The architect of the Provincial Government, Philip Herepath, designed a new construction with an Italianate style which was built for approx. £44,600 in 1877 (refer to Figure 34). During the administration of T M Philson, many charity cases were taken on by the new hospital, which brought well reputation to it. The hospital then became well known in public. However the problem of continually understaffed and overcrowded condition did not respond well to this. The issues of poorly trained staff were also found in the complaints, which was changed only in 1883 due to
the employment of Miss Crisp who became a new matron of this hospital. "The new matron was Miss Crisp from England who had been trained in the tradition of Florence Nightingale. She transformed the hospital within months and instituted nursing training. The hospital became a real hospital caring for sick patients rather than acting as an institution for poor old men suffering from alcoholism."[41]

In order to make space for a new building which was designed by the architectural firm Stephenson & Turner, the Herepath building was removed in 1964. It was completed in 1967 and currently still functions as a support building near the latest complex. As a model of state-owned companies of New Zealand, Auckland Hospital provided medical treatments as a business of service in the early 1990s, during the time of revisions and reformation of the health system. And also the official name of Auckland Hospital was changed to Auckland Crown Health Enterprise during that time of reforms.

Opened in 2003, the current hospital complex is a group of four previously independent facilities: Auckland Hospital, Starship Children's Hospital, Greenlane Clinical Centre, and National Women's Hospital.

The current main hospital locates in a 180 million NZ dollars building that was constructed between 2000 and 2003 (Figure 35). It has totally nine floor levels, five levels lower than the old hospital building, which has functioned as a support building now. Designed by Jasmax, the new hospital building has a total floor area of 75,575 sq. meters, which makes it one of the largest public buildings in New Zealand. The construction works were carried by

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2. Climate

Auckland does not have four distinct seasons in a year compared with many other inland cities in other countries. According to NIWA, Auckland has a subtropical climate, with warm, humid summers and mild, damp winters.\[^{42}\]

As to the incidence angle of sun light, in Auckland, the sun’s altitude at solar noon is 76.7° on December 22 and it is 29.7° on June 22.\[^{43}\] And the time of solar noon is around 1 o’clock on December 22 and 12 o’clock on June 22.\[^{44}\]

In summer, Auckland temperature is cooler than many cities on a similar latitude as it is surrounded by the Pacific Ocean (a comparison of average temperatures between three cities refer to Figures 36, 37, and 38). But because of exposure to the direct sunlight, it can be overheated in the summer, which is the main weather hazard in Auckland.

The wind statistics are based on real observations taken between 01/2004 - 08/2015 daily from 7am to 7pm local time at Auckland Grey Lynn weather station which is closest to Grafton (Figures 39 and 40). The cold winter wind from the southeast has a major impact on people’s comfort. Generally speaking, Auckland is quite suitable for human living all-year round which is helpful for creating a salutogenic micro-environment.

Fig. 39: Wind direction distribution in percentage at Grey Lynn

<table>
<thead>
<tr>
<th>Month of year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Year</th>
</tr>
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<tbody>
<tr>
<td>Dominant Wind dir.</td>
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<td>&gt;= 4 Beaufort (%)</td>
<td>4</td>
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<td>3</td>
<td>3</td>
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<td>3</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Average Wind speed (kts)</td>
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<td>3</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Average air temp. (°C)</td>
<td>16</td>
<td>20</td>
<td>10</td>
<td>17</td>
<td>14</td>
<td>13</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>16</td>
<td>14</td>
</tr>
</tbody>
</table>

Fig. 40: Wind directions in different months at Grey Lynn
IX. Design Challenges

In order to improve users’ sense of coherence, and then to achieve salutogenesis, many design elements, like way-finding, views, natural light, and green elements need to be considered (Figure 41). The change of scale will vary from overall shape to detailed rooms.

Firstly, the main building of Auckland City Hospital is located in the centre of a group of high-rise buildings, views from the building to Auckland Domain and many other places are largely restrained. Also the spaces close to the building are occupied by roads which isolate the hospital as an untouchable place. (Figure 42)

The main building of Auckland city hospital was designed in the 1990s under the residual influence of the industrialisation movement; functional efficiency was the primary consideration. However, from a salutogenic point of view, the overwhelming bulk and institutional appearance of the building put too much stress on people who wanted to get close to it. Closed by steel fence, the south façade has no gesture of welcoming the residential area on the south (Figure 43). The general appearance of the whole building rejects people’s interaction with it. It reduces people’s sense of comprehensibility, manageability, meaningfulness as to a sense of
Currently, Auckland City Hospital operates as several one-floor small hospitals of different functional departments. Each department or programme occupies some space on a flat floor area. The main building has nine levels as follows:

Level 1 - Clinical record, sterile supply service
Level 2 - Blood bank, children’s and adults emergency departments
Level 3 - Coronary care, cardiology department
Level 4 - Cardiothoracic and vascular department, intensive care units, operating theatres

Speaking of the building entry, most users come from Park Rd on the south. There is only one entrance for non-urgent patients and visitors to get in the main building without entering the support building, and that entrance is on the east facade right off the road under the bridge between the main and the support buildings, which is very unfriendly for pedestrians (Figure 44). It could create an anxious environment and lower the sense of meaningfulness of visitors.
Level 5 - Radiology department
Level 6 - General medicine, infectious diseases, dermatology, older people's health, cancer and haematology wards
Level 7 - Surgery rooms, urology, gastroenterology, orthopaedic, and respiratory wards
Level 8 - Operating rooms, critical care, neurosurgery wards, neurology
Level 9 - Operating rooms, maternity and gynaecology, newborn intensive care units

This typology of organizing functions can easily confuse patients and visitors. Walking on such a huge floor plate could be like walking in a maze. Models of the main circulations on each floor area has been made (Figures 45 and 46). People can hardly orient themselves because of the similar and mediocre interior environments on each floor which can decrease manageability from the view of sense of coherence. There is no intuitive indication which can help them understand where they are. The way-finding process heavily rely on the information board on the wall in each area. (Figure 47)
People in the hospital circulate around two huge vertical voids. These two void spaces are supposed to be responsible to bring natural light and healing atmosphere into the hospital because of the deep floor plan and holistic opacity of shape. However, its enormous scale makes it uncomfortable for people sitting inside. Also, their height-to-width ratio is not efficient to bring in natural light most times of the year. (Figure 48)

Fig. 48: Diagrammatic section of the hospital
X. Design Processes

1. Experimental Survey

Inspired by Alan Dilani’s theory about how design elements affect people’s sense of coherence, an experimental survey was implemented by me and two other partners, Yuming Fu and Ding Li. Hospital waiting space is for patients or visitors to wait during gaps of treatment, during which time people mostly remain in an idle state. In order to experience much more about how design factors affect salutogenic feelings in the waiting spaces, we visited waiting spaces of different facilities, from large hospitals to small clinics, from cinemas to supermarkets. (Refer to Figure 49) We identified ten design elements, including aesthetic impression, light quality, colour selection, decoration quality, natural access, noise and music, view penetration, rationality of space, influence of other people, and smell to grade the space by the standard of sense of coherence. We created a form to grade each element in different places (Filled form refer to Figure 50, 52, and 54). We identified that the key elements that affect

Fig. 49: Locations of examination points
Sense of Coherence are light quality, view penetration, natural access, and rationality. (Outcomes refer to Figures 51, 53, and 55) These four elements tend to correspond well with the level of sense of coherence which is consistent with Alan Dilani’s argument.

<table>
<thead>
<tr>
<th>1. Sense of Comprehensibility</th>
<th>Waitakere Hospital</th>
<th>The Doctors clinic</th>
<th>Auckland City Hospital</th>
<th>Cancer and Blood Service</th>
<th>Burger King</th>
<th>Lynnmall Corridor</th>
<th>Pakn Save</th>
<th>St.Jukes Food</th>
<th>St.Jukes Cinema</th>
<th>CBD Cinema</th>
<th>Britomart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you feel things are not confusing and making sense?</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Do you feel like you know what’s going to happen next or what’s coming?</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Sense of Manageability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you feel that things are manageable or within control?</td>
</tr>
<tr>
<td>Do you feel that you have the necessary skill or ability or help to take care of things?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Sense of Meaningfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you feel that things are interesting or fascinating, a source of pleasure or satisfaction?</td>
</tr>
<tr>
<td>Do you feel that things are worth it, that there is good reason or purpose to care about what happens?</td>
</tr>
</tbody>
</table>

| Physical Environment Grading: |
|------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| 1. Primary Aesthetic Impression | 3 | -1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 2 | 2 |
| 2. Light Quality (natural and artificial) | 3 | 0 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3. Colour Selection (walls, floor, etc) | 1 | 1 | 1 | 0 | 3 | 1 | 0 | 0 | 1 | 1 | 0 |
| 4. Decoration Quality (artworks, texture, etc) | 1 | 0 | 1 | 0 | 0 | 0 | -1 | 0 | 1 | 2 | 1 |
| 5. Nature Access (green, plants, etc) | 1 | -1 | 2 | 3 | 1 | 0 | 1 | 0 | -1 | -1 | 0 |
| 6. Noise and Music (from machine or other people) | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 7. View Penetration (multiple spaces, high ceiling, big windows, etc) | 2 | 0 | 1 | 1 | 2 | 1 | 3 | 1 | 1 | 0 | 1 |
| 8. Rationality of Space (way-findings, signage, room layout, etc) | 2 | 1 | 2 | 2 | 1 | 0 | 2 | 1 | 0 | -1 | 1 |
| 9. Influence of Other People (crowding, etc) | 1 | 0 | 0 | 0 | 0 | -1 | 0 | 0 | -1 | 1 | 1 |
| 10. Smells | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 |

A Particular Thing You Find Comfortable or Uncomfortable

(-5 means very negative, 0 means average, 5 means very positive)

Fig. 50: Grade form filled by Kai
Fig. 51: Indication of Kai's form
<table>
<thead>
<tr>
<th>1. Sense of Comprehensibility</th>
<th>Waitakere Hospital</th>
<th>The Doctors clinic</th>
<th>Auckland City Hospital</th>
<th>Cancer and Blood Service</th>
<th>Burger King</th>
<th>Lynnmall Corridor</th>
<th>Paknsave</th>
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<th>St.Jukes Cinema</th>
<th>CBD Cinema</th>
<th>Britomart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you feel things are not confusing and making sense?</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Do you feel like you know what’s going to happen next or what’s coming?</td>
<td>1</td>
<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

2. Sense of Manageability

| Do you feel that things are manageable or within control? | 2 | 2 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| Do you feel that you have the necessary skill or ability or help to take care of things? | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |

3. Sense of Meaningfulness

| Do you feel that things are interesting or fascinating, a source of pleasure or satisfaction? | 1 | 0 | 2 | 1 | 1 | 0 | 2 | -1 | 1 | 2 | 2 | 1 |
| Do you feel that things are worth it, that there is good reason or purpose to care about what happens? | 2 | 1 | 2 | 2 | 1 | 0 | 1 | 1 | 1 | 2 | 1 |

Physical Environment Grading:

1. Primary Aesthetic Impressions | 2 | 0 | 1 | 1 | 1 | 1 | 2 | 0 | 1 | 2 | 1 |
2. Light Quality (natural and artificial) | 1 | 1 | 3 | 2 | 1 | 3 | 1 | 2 | 0 | 0 | 2 |
3. Colour Selection (walls, floor, etc) | 1 | 1 | 1 | 0 | 1 | 2 | 1 | 1 | 3 | 1 | 1 |
4. Decoration Quality (artworks, texture, etc) | 2 | 0 | 1 | 1 | 2 | 1 | -1 | 2 | 3 | 1 | 2 |
5. Nature Access (green, plants, etc) | 2 | 0 | 1 | 3 | 1 | 0 | -1 | -1 | -2 | 0 |
6. Noise and Music (from machine or other people) | 2 | -1 | 0 | -1 | 0 | -1 | -1 | -2 | -1 | -1 |
7. View Penetration (multiple spaces, high ceiling, big windows, etc) | 3 | 0 | 1 | 2 | 2 | 1 | 1 | 0 | 1 | 1 |
8. Rationality of Space (way-findings, signage, room layout, etc) | 3 | 0 | 2 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 3 |
9. Influence of Other People (crowding, etc) | 2 | -1 | 2 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 |
10. Smells | 3 | 2 | 2 | 2 | 0 | 0 | 0 | -1 | 0 | 1 | 0 |

A Particular Thing You Find Comfortable or Uncomfortable

("5 means very negative, 0 means average, 5 means very positive")

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Fig. 52: Grade form filled by Yuming
Fig. 53: Indication of Yuming's form
<table>
<thead>
<tr>
<th>1. Sense of Comprehensibility</th>
<th>Waitakere Hospital</th>
<th>The Doctors Clinic</th>
<th>Auckland City Hospital</th>
<th>Cancer and Blood Service</th>
<th>Burger King</th>
<th>Lynnmall Corridor</th>
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<th>St. Lukes Food</th>
<th>St. Lukes Cinema</th>
<th>CBD Cinema</th>
<th>Britomart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you feel things are not confusing and making sense?</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Do you feel like you know what’s going to happen next or what’s coming?</td>
<td>2</td>
<td>2</td>
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</table>

2. Sense of Manageability

| Do you feel that things are manageable or within control? | 3 | 1 | 8 | 2 | 2 | 0 | 2 | 0 | 1 | 0 | 2 |
| Do you feel that you have the necessary skill or ability or help to take care of things? | 2 | 2 | 8 | 2 | 3 | 1 | 2 | 0 | 1 | 0 | 1 |

3. Sense of Meaningfulness

| Do you feel that things are interesting or fascinating, a source of pleasure or satisfaction? | 1 | 0 | 2 | 1 | 1 | 0 | -1 | 1 | 1 | 1 | 1 |
| Do you feel that things are worth it, that there is good reason or purpose to care about what happens? | 2 | 1 | 1 | 2 | 2 | 1 | 0 | 1 | 1 | 1 | 1 |

Physical Environment Grading:

| 1. Primary Aesthetic Impression | 2 | 0 | 3 | 2 | 1 | 1 | 0 | 1 | 2 | 0 | 1 |
| 2. Light Quality (natural and artificial) | 1 | 1 | 2 | 2 | 2 | 0 | 1 | 1 | 2 | 0 | 1 |
| 3. Colour Selection (walls, floor, etc.) | 2 | 1 | 2 | 1 | 3 | 0 | 0 | 0 | 2 | 1 | 1 |
| 4. Decoration Quality (artworks, texture, etc.) | 3 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5. Nature Access (green, plants, etc) | 3 | 0 | 3 | 2 | 1 | -1 | 1 | 0 | -1 | -2 | 1 |
| 6. Noise and Music (from machine or other people) | 2 | 1 | 2 | 0 | 1 | -1 | -1 | -2 | -1 | -2 | 1 |
| 7. View Penetration (multiple spaces, high ceiling, big windows, etc.) | 2 | 0 | 3 | 1 | 2 | 1 | 1 | -2 | 1 | 1 | 2 |
| 8. Rationality of Space (way-findings, signage, room layout, etc) | 4 | 1 | 2 | 2 | 1 | 0 | 1 | 0 | 2 | -1 | 0 |
| 9. Influence of Other People (crowding, etc) | 2 | 1 | 1 | 1 | 1 | -1 | -1 | -2 | 0 | -1 | 1 |
| 10. Smells | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |

A Particular Thing You Find Comfortable or Uncomfortable

(-5 means very negative; 0 means average, 5 means very positive)

Fig. 54: Grade form filled by Ding
2. Exploration of Building Shape

First of all, the enormous scale of the bulk of the building translates to an industrial pursuit of machinery functionality. The shape needs to be scattered to be more human-scale. Also, a smaller scale of the building can be more efficient to bring in more natural light and ventilation. Different types of shapes have been tested to fit with better natural light and interior atmosphere.

- Open Street Typology

In order to blend the interior walk path with exterior atmosphere and bring in the sun light from the north, the linear interior corridor can be opened up to the sky and create a sense of main street to allow better view penetration and increase sense of comprehensibility. (Figures 56 and 57)

Fig. 56: Open street typology light and view penetration

Fig. 57: Physical model of open street typology
• **Podium on Platform Typology**

This typology is a deviant from the traditional high-rise pavilion typology. The roof top of the platform can be utilized to create a nice environment. It allows view penetration and natural light infiltration between the “wings”. (Figures 58 and 59)

![Fig. 58: Physical model of Podium on platform typology](image1)
![Fig. 59: Podium on platform typology view penetration](image2)

• **Tower on Platform Typology**

The typology is a variation of the previous one. Different height of towers create many void spaces in-between for more casual activity to create healing environment. Lower towers on the north allow more sun light to get into southern towers. (Figures 60 and 61)
- **Central courtyard typology**

In this typology, different levels of void space form a huge funnel-shaped courtyard to get better access to natural elements like light and green. People from upper floors can have better a view to the opposite side and courtyard. (Figures 62 and 63)
• **Internal Negative Space Typology**

This typology creates views from the inside. Interior vertical and horizontal voids form more human-scale places for casual activities and enhance the interaction between different departments and levels. Inner spatial identity and diversity are also improved for better sense of manageability and meaningfulness for patients and visitors. (Figures 64 and Figure 65)

![Fig. 64: Physical model of internal negative space typology](image1)

![Fig. 65: Internal negative space typology scale and layout](image2)

Considering all the advantages and disadvantages of these different possibilities, the combination of a tower on platform typology, a central courtyard typology, and an internal negative space typology can be very effective in improving light reception, view penetration and providing visual indicators. The idea of random towers with a central courtyard is taking shape.
3. Organisation and Circulation

The current way the current hospital organizes functions is by different levels. Each department occupies an area on a certain floor (refer to Figure 66). New patients and visitors will have at least two location-asking steps and confusing way-finding processes before they find the area they need to be in. As a first step, they need to ask which level has the department and doctors: they need to primarily locate the target area. In the second step, for detailed location, they need to go to the level and ask where they can meet the doctors or wait for doctors to come. (Figure 67) Also the way-finding circulation will be mostly on one large floor area which is very easy for people to be disorientated. All this complicated process can largely increase anxiety and lower manageability, hence decrease the sense of coherence.

In this project, the concept of “boxes group” has been introduced. Each distinct box has a small number of functional departments of the original hospital. (Figure 68) Because of the different identity of each box, it can easily help patients and visitors identify the desired location and assist in orientation. It will change the situation of the first step in
the way-finding process with a comprehensible, manageable, and meaningful method.

In between the boxes, different scales of space can be generated, which can be a courtyard, garden, void and so on. Because each box contains several levels of floor area, vertical circulation will be more emphasized than the current horizontal circulation on the deep floor plan. The use of vertical circulation helps people identify their location by recognizing their level in the hospital. Also flowing, boxes bring better views for inside space. Natural elements in between boxes can create a comfortable environment. (Figure 69)
In previous researches and many other reports, colour has been proven to be very influential to viewers’ psychological activities and emotions.\textsuperscript{[45]} It is also an effective way to catch attention because of the mechanism of human eyes.\textsuperscript{[46]} Colour exists in materials; different colours of materials can be very effective to indicate the location and directions as well as to smoothen people’s emotions.

Narita airport’s terminal three in Tokyo uses a colour coding system with comfortable materials for circulation and interior design. It is a very intuitive way of indication and people do not need to stop and read the signs. “[They] have delivered a very simple yet effective design on what they have described as ‘half the usual budget’ for such a space. This budgetary restrained has seen the removal of moving walkways, or the traditional illuminated airport signs, and instead has brought in running tracks and painted concrete walls to direct passengers.”\textsuperscript{[47]} (Figures 70, 71, and 72)

Therefore, the idea of “colour boxes” has been gradually formed. (Figure 73 and 74) The colour can add significant distinctions in the “boxes group” and a dynamic atmosphere into the space. People will much more easily identify their location. The use of natural materials with their distinct natural colours will assist in create a healing environment and an increased sense of coherence.

Fig. 74: Physical model of colour boxes

Fig. 73: Concept of colour boxes
4. Waiting Space Models

There are generally two types of waiting spaces in hospital: private waiting space and public waiting space. There is no absolute distinctive definition between these two types; but public waiting space tends to have larger scale spaces, better views and light, more chairs, and more service facilities for patients, visitors, and staff. In contrast, private waiting space tends to have smaller scale spaces and more concentrated layout for patients and their family. (Figure 75) Material, natural element, and view are critical to increase the comprehensibility, manageability, and meaningfulness of spaces, and hence increase the sense of coherence in them. In order to get a better understanding of the different types of spatial qualities in waiting space, digital detail models have been made during the research to inform the final outcome.

Fig. 75: Two types of waiting space
• **Linear Public Waiting**

This is a concept of public waiting space. As an important part of the circulation, linear corridors are very dynamic. Linear circulation can be designed as public waiting space. Adding a void in between levels can create a healing space to smooth the atmosphere. It also makes it easy to lighten the area on the lower levels. Plants and flowers provide a nice view for the people walking around. At the same time, chairs and tables towards the void allow people to wait there and have a good rest. (Figures 76 and 77)

![Fig. 76: Waiting in linear space](image1)
![Fig. 77: View from waiting space to void in linear space](image2)
• Circular Public Waiting

This is another public waiting space concept. It is the end or the central space of a circulation. It has more characteristics of a static status. A non-directional circular courtyard can really make for a tranquil atmosphere. View penetration and light quality are also improved. Because the courtyard can be relatively large, people can sit and rest on the chairs in the central green area. (Figures 78 and 79)
• **Semi-public Waiting**

This is a semi-public waiting space concept. Height difference is used to separate the space and give people on the upper floor better privacy and better view. Plants and flowers on the lower floor create an atmosphere of natural environment and also a green barrier. The staircase emphasizes the connectivity of public space to semi-public space. (Figures 80 and 81)
• Visual Divider in Private Waiting

This is a concept of private waiting space. The scale is relatively small and traditional, and its location is likely to be close to the reception area or doctors’ office. Natural materials like stone and timber can really eliminate stress. Timber battens go up to the ceiling, creating translucent barriers for privacy. Vines on the timber and small plants on the table can increase the sense of coherence. Couches near the window provide a nice view to the outside. (Figures 82 and 83)

Fig. 82: Private waiting near natural enclosure

Fig. 83: View from the inside of the natural barrier
• **Positive Distraction in Private Waiting**

This is another concept of private waiting space. The space is directional by creating an eye-catching view on one side of the space. Behind the glass, plants, flowers, sculpture, and water function as positive distractions for people in this room. Also, the stone wall at the end of the view can work as a frame for view penetration to the activities outside the room. Consequently, the sense of comprehensibility and meaningfulness can be improved. (Figures 84 and 85)
5. Detail Design Focus

Considering building shape, department location, and functional requirement, the project has been developed to be this shape as shown by the diagram (Figure 86 and 87). The first three levels are underground on the south façade which mostly remain their shapes and functions as the current building. The shape above level 3 has the most changes in this project, with each main department having a distinct colour of material and is located in a distinct block. (Figure 88)
In order to break the barrier of the south façade, as well as to create a welcoming gesture for the southern residential area and animate the Grafton suburban, another main entrance for pedestrians opens in the middle of the façade facing Park Avenue directly. (refer to the diagram on the right) It encourages people who live close to it to come on foot.

Because a large proportion of the current hospital is redesigned for better salutogenic solution, this project will not re-create every detail of the whole building. Instead, the detailed design will focus only on the “yellow box” (Refer to Figure 88) on the east-south corner from level 4 to level 6 which contains commercial shops, outpatient clinics, general medicine, head, neck and head, ear, nose and throat, and respiratory departments.

The outpatient clinic floor plan is organized around a lighting void which collects and reflects the sunlight from roof top down to lighten the lower floor area. Two staircases and two elevators are in the void space. Also, the commercial shops can provide a nice distraction for upset patients and also visitors. They will help to neutralize the institutional feeling of the hospital and will create a more dynamic atmosphere in this place. (Figure 89)
The upper floors, levels 5 and 6, have a similar layout with the void space at the middle; wards and treatment rooms circle along the exterior wall. Materials of natural colour are used in the interior design to generate a healing space. The central void largely increase the view penetration of this overall floor plan. It brings better natural light and visual distraction, which will increase the sense of coherence for patients (Figures 90 and 91). The treatment rooms include spaces for interview space, procedure, and medication. Also, the storage also has different types which will be finalized in the next step.
Fig. 90: Diagrammatic floor plan of level 5

Fig. 91: Diagrammatic floor plan of level 6
Except for the floor plans of the hospital departments, there are two major courtyards in this project, namely, the one in the centre and another one on the north. (Figure 92) They both act as important waiting spaces which will be taken into consideration in the detailed design. The central courtyard is much more dynamic than the back one which means the central courtyard needs more natural elements, more space for activities, and more positive distractions for patients and visitors. The back courtyard is more static; it needs more green views, sunlight, and facilities for waiting or resting.
6. Curtain Wall Design

The curtain roof at the top of the central void and the curtain wall enclosing the back courtyard are louvred glazing systems. Because both systems almost face the true north, the angle and spacing of the louvers can determine the shading performance. They need to provide enough shading during the summer noon and also let light penetrate in the days of winter.

The central courtyard curtain roof is an operable aluminum louver system. Effective solar shading can be achieved by using an operable shading louver system on the central courtyard’s roof. The angle of the louvers is adjusted throughout the day to provide optimal shading. (Figures 93 and 94)

Fig. 93: Sunlight shading diagram on curtain roof louvres
Fig. 94: Interior view of curtain roof louvres
The curtain wall on the back courtyard is a fixed timber louver system. The width of the louvers is 1 meter, with a space of 1.2 meter. The system provides good shading in summer and allows an amount of sunlight penetration in winter. (Figures 95 and 96)
XI. Design Outcome

1. Building Form

The building form has been finalised by salutogenic principles on the basis of the “colour boxes” concept. (Figure 97)
With the first three levels unchanged and having the same functions and shapes, the final building form contains nine main departments:

Part 1 - General medicine (outpatient clinics, general medicine wards, head & neck, ear, nose & throat, respiratory)

Part 2 - Urology & orthopaedics

Part 3 - Heart & vascular (heart & vascular, children’s heart care, cardiac investigation unit, cardiac physiology unit)

Part 4 - Dermatology & infectious

Part 5 - Gynaecology (maternity, labour & birthing suite, gynaecology, newborn intensive care, operating room);

Part 6 - Surgery centre (operation theatre, heart & lung surgery, kidney & liver transplant, neurosurgery)

Part 7 - Cancer & haematology

Part 8 - Neurology (neurology, critical care);

Part 9 - Radiology

<table>
<thead>
<tr>
<th>Floor Area (sq. meter)</th>
<th>Current Hospital</th>
<th>This Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Medicine</td>
<td>3830</td>
<td>3310</td>
</tr>
<tr>
<td>Urology &amp; Orthopaedics</td>
<td>1810</td>
<td>1440</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>6750</td>
<td>5350</td>
</tr>
<tr>
<td>Operation Centre</td>
<td>7630</td>
<td>7670</td>
</tr>
<tr>
<td>Cancer &amp; Haematology</td>
<td>2046</td>
<td>1770</td>
</tr>
<tr>
<td>Neurology</td>
<td>5120</td>
<td>5900</td>
</tr>
<tr>
<td>Radiology</td>
<td>3590</td>
<td>6110</td>
</tr>
<tr>
<td>Dermatology &amp; Infectious Disease</td>
<td>3750</td>
<td>6520</td>
</tr>
<tr>
<td>Heart &amp; Vascular</td>
<td>4940</td>
<td>4710</td>
</tr>
</tbody>
</table>

A comparison of the approximate floor area of each department between the existing hospital and this project is listed in Figure 98. Some departments in the current hospital are removed for floor area and building bulk control. Also, many rooms of the unchanged departments are reduced and removed for better natural light, view penetration, and open space to achieve salutogenic purpose.

Fig. 98: Department comparison between current hospital and the new project
2. Material Selection
Different materials with comfortable colours, such as timber, brick, concrete and so on, are used on the surfaces of the different department blocks. (Figure 99) They aim to make it easier to be recognized and distinguished by people and also create a dynamic healing atmosphere.

Fig. 99: South facade materials such as glass, timber, brick, and concrete

3. Courtyards
As mentioned in previous analysis, the current central void space of Auckland City Hospital does not work as expected and more human-scale courtyards are still needed. In this project, both courtyards are on the top of lower roofs that create green roof gardens. The central courtyard is a big void space on the top of the level 3 roof. It contains two smaller voids that go down to the floor of level 3 and level 2 (Figure 101). The central void also extends to the roof top of the Cancer and Haematology department. It provides many facilities for patients and visitors to wait, rest, and play. There are even place you can get a coffee or other drinks or where they can play mini golf or just want to rest and have a good view. (Figure 100)
The north courtyard is more static because it is at the end of a part of the circulation. It offers more green and chairs for patients to rest. (Figure 104) The circle of void brings natural light to the lower level which also creates a nice waiting space for the lower floor. (Figure 103)
4. General Medicine Department

As the previous analysis demonstrates, the floor plans of the general medicine department are finalized as shown in the diagrammatic figures (Figures 104, 105, and 106)
Fig. 105: Level 5 floor plan
Fig. 106: Level 6 floor plan
5. Application of Electronic Devices

The use of electronic devices can significantly improve people’s sense of coherence by providing the information they need. The reason why people have to wait in a certain space is that the staff need to come to them to explain the next step of the treatment. It limits patients’ range of activity. However, the introduction of electronic devices will largely solve that problem. When a patient first reaches any staff at the reception, he will be given a device with a small screen on it. It may look like the one on Figure 107.

The said gadget can be put on one’s wrist or in his pocket. It shows the next step of treatment and the estimated time left for that process. In this way, he can go anywhere he wants instead of just sitting there. When the time of the next process is near, the device will buzz and provide information on the screen. It would increase a patient’s sense of comprehensibility and improve his health condition. At the same time, in the wards, it can provide lightweight portable devices with larger screen that give patients relative information, so they can feel that things are comprehensible and manageable. Also, interacting with the devices creates a positive distraction that finally improves patients’ health.
II. Conclusion

This project explored the theory of salutogenesis and the various ways of applying salutogenic principles to a hospital. The salutogenic theory focuses on dealing with health rather than disease. It describes the relation between health and disease as a continuous variable which will move towards health or disease depending on the tension and tension management. The concept of a sense of coherence works as that critical variable. The sense of coherence has three components, namely, sense of comprehensibility, sense of manageability, and sense of meaningfulness. Those senses determine the physical condition of a person.

A sense of coherence works similarly to emotions and feelings which can be largely affected by instant psychical environment. This is why the basis of this project is the re-creation of a different psychical environment that will improve people’s sense of coherence, hence, move them towards the health end of the salutogenesis continuum. The design elements of a healthy built environment were explored and examined. Colours, nature, perception, rationality, etc. affect the sense of comprehensibility. Similarly, aesthetic elements, such as natural light and green, interior atmosphere, etc. can affect the sense of manageability. Lastly, social support, art, view penetration, positive distraction, etc. can affect the sense of meaningfulness.

The re-creation of Auckland City Hospital started with adjustments to the shape. Then the idea of “colour boxes” inspired a way of organization and circulation. Also the waiting space, as the focus
of this project, was explored using digital models. After the test of the different types of waiting
space and their spatial atmosphere, they inspired the healing space to take shape in the building’s
in-between spaces. And it improved people’s sense of coherence by applying salutogenic elements
like void space, green garden, natural light and material. The feeling of a strong sense of coherence
is a psychological activity which is difficult to be described by words, it has been demonstrated by
images of exterior and interior spaces in this project.

Another attempt of this project is to animate the Grafton suburb by re-creating a healing place that
welcomes people to come and gather. The building will influence the neighbourhood and bring them
to a healthier condition which is the ultimate purpose of salutogenic design. The project achieved its
research goal and it brings more possibilities into this area, in which the principles of health will start
to change more and more unsatisfactory built environment.
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XV. Appendix
Salutogenic Design: Auckland City Hospital

This project explores the theory of salutogenesis and the various ways of applying salutogenic principles to a hospital. The salutogenic theory focuses on dealing with health rather than disease. It describes the gradation between health and disease as a continuum, with a patient moving towards health or disease depending on the treatment and lifestyle management. The concept of a Centre of Excellence within the hospital is an example of this.

The site of the hospital has been designed to create a sense of manageability, a sense of meaningfulness. These senses determine the physical conditions of a place.

A sense of manageability is similar to emotions and feelings, which can be largely affected by the patient's environment. This is why the site of the hospital is the creation of a different environment that will improve people's sense of manageability, hence move them towards the health end of the salutogenesis continuum. These elements of a healthy built environment were explored and examined, i.e., natural light, green, ventilation, etc., that can affect the sense of manageability. Lastly, social support, art, and the effects of the environment on the overall well-being of patients were considered.