THE INFLUENCE OF 21ST CENTURY TECHNOLOGY FOR THE PHYSICALLY IMPAIRED IN THE BUILT FORM

A proposed Empowerment academy in Durban

Krishen Singh

213504966

Supervisor

Viloshin Govender

A Dissertation Submitted in partial fulfilment of the

Requirements for the degree of Master of Architecture to

The School of Built Environment and Development Studies

University of KwaZulu-Natal

Durban, South Africa

03 March, 2020

DECLARATION

Submitted in fulfilment of the requirements for the degree of Master of Architecture, in the Graduate Programme in Architecture, University of Kwa-Zulu Natal, Durban, South Africa I declare that this dissertation is my own unaided work. All citations, references and borrowed ideas have been duly acknowledged. I confirm that an external editor was not used. It is being submitted for the degree of Master in Architecture in the faculty of Humanities, within the school of Built Environment & Development Studies, KwaZulu-Natal, Durban, South Africa. None of the present work has been submitted previously for any degree or examination in any other University.



……..

Mr Krishen Singh

Student No. 213504966

Date

ACKNOWLEDGEMENTS

I would like to thank the following people for their assistance through this process:

- First and foremost, I would like to thank God for his many blessings, I am truly grateful.
- To my family, thank you for your unwavering support, guidance and motivation.
- Naresh Singh, thank you for teaching me everything I needed to know in this career and for your vital role in shaping me into the designer I am today.
- Mr Viloshin Govender, my supervisor and mentor, thank you for your guidance and assistance throughout my entire architectural career.
- Thank you to the dedicated staff of the architecture department for your constant guidance and support.

DEDICATION

To my mother, father and brother for their love and constant support through this journey of mine. This would not have been possible without your support and motivation. Thank you for all the times you had faith in me even when I lacked faith in myself. Thank you to my parents for all the sacrifices you made to ensure that my future is bright. I am truly grateful to you all for shaping me into the man I am today.

When things go wrong, as they sometimes will,
When the road you're trudging seems all uphill,
When the funds are low but the debts are high,
And you want to smile but you have to sigh,
When care is pressing you down a bit…
Rest if you must, but don't you quit!

Life is queer with its twists and turns,
As every one of us sometimes learns,
And many failures turn about
When we might have won had we stuck it out.
Don't give up though the pace seems slow…
You may succeed with another blow.

Often the struggler has given up
When he might have captured the victor's cup;
And he learned too late when the night came down,
How close he was to the golden crown.

Success is failure turned inside out…
And you can never tell how close you are
It may be near when it seems so far.
So stick to the fight when you're hardest hit
It's when things seem worst that you must not quit.

(Edgar A. Guest)

ABSTRACT

South Africa is a developing country with a strong history of segregation and discrimination that is engraved in the lives and memories of its' people. 2020 celebrates 26 years of democracy yet, the country still faces many obstacles. One of these obstacles being a lack of awareness and funding for individuals with disabilities. In the 21st century, disability isn't something that should be hidden. Individuals with disability should be treated as equals and provided with equal opportunities as they are capable of being self-sufficient. Considering the rapid advancement in technology, this dissertation aims to develop an understanding of the needs of the physically impaired in their transition into adulthood and to assist them in developing skills to be independent in the 21st century. This study will explore how the needs of the physically impaired can be incorporated into the built environment in the context of 21st century technology.

The research explores theories that are related to the built environment, 21st century technology and individuals with physical impairments. It determines how spaces should be designed to promote healing and comfort.

The study investigates facilities that cater for the physically impaired around Durban as well as well-known facilities internationally.

The research findings contribute to a design brief which is aimed at providing an empowerment academy in Durban that will help individuals with physical impairments to develop skills for jobs in the 21st century to be self-sufficient.

Table of Contents

DECLARATION ..... **i**
ACKNOWLEDGEMENTS ..... **ii**
DEDICATION ..... **iii**
ABSTRACT ..... **iv**
LIST OF TABLES ..... **viii**
LIST OF FIGURES ..... **ix**
1.1 INTRODUCTION **1**
1.1.1 Background 2
1.1.2 Motivation/ justification of the study 3
1.2 DEFINITION OF THE PROBLEM, AIMS AND OBJECTIVES **5**
1.2.1 Definition of the problem 5
1.2.2 Aims 6
1.2.3 Objectives 6
1.3 SETTING OUT THE SCOPE **6**
1.3.1 Delimitation of the research problem 6
1.3.2 Definition of the terms 6
1.3.3 Stating the Assumptions 8
1.3.4 Key Questions 8
1.3.5 Hypothesis 8
1.4 CONCEPTUAL FRAMEWORK **9**
1.4.1 Theory of universal design 9
1.4.2 Empowerment theory 11
1.4.3 Phenomenology 12
1.5 RESEARCH METHODS AND CASE STUDY **13**
1.5.1 Introduction 13
1.5.2 Research philosophy and strategy 13
1.5.3 Secondary data collection 13
1.5.4 Primary data collection 14
1.5.5 Research materials 15
1.5.6 Research analysis 15
1.5.7 Conclusion 16
1.5.8 outline of chapters 16
CHAPTER 2: UNIVERSAL DESIGN **19**
2.1 Introduction 19
2.2 Evolution of Universal design 20

2.3 The influence of physical impairments in the built environment 25
2.4 The transition of Universal Design into a technological era 28
2.5 Globalisation and the fourth industrial revolution: A new approach to universal design ... 33
2.6 Conclusion 45
CHAPTER 3: REQUIPING THE DISADVANTAGED FOR THE 21ST CENTURY 47
3.1 Introduction 47
3.2 Critically understanding the disabled community 47
3.3 Empowerment as a process fo social enhancement 54
3.4 Conclusion 58
CHAPTER 4: EMPOWERING THE PHYSICALLY IMPAIRED THROUGH MULTISENSORY DESIGN 60
4.1 Introduction 60
4.2 How sensory design influences the built environment 61
4.3 Holistically fusing sensory stimulation for an enhanced experience of spaces 68
4.4 How multisensory architecture empowers healing and learning 72
4.5 Conclusion 79
KEY PRECEDENT STUDIES 80
CHAPTER 5 KEY PRECEDENT STUDIES 81
5.1 INTRODUCTION 81
5.2 PALO ALTO POLYTRAUMA AND BLIND REHAB CENTER 81
5.2.1 Project description 82
5.2.2 Justification of precedent study 83
5.2.3 Urban setting 83
5.2.4 Project objectives ..... **Error! Bookmark not defined.**
5.2.5 Programme an planning ..... **Error! Bookmark not defined.**
5.2.6 Design Rationale ..... **Error! Bookmark not defined.**
5.2.7 Conclusion 92
5.3 SPALDING REHABILITATION HOSPITAL 93
5.3.1 Project description 94
5.3.2 Justification of precedent 94
5.3.3 Urban setting 95
5.3.4 Project objectives ..... **Error! Bookmark not defined.**
5.3.5 Progamme and Planning ..... **Error! Bookmark not defined.**
5.3.6 Design Rationale ..... **Error! Bookmark not defined.**
5.3.7 Conclusion 101
KEY CASE STUDIES 102

CHAPTER 6 KEY CASE STUDIES **103**
6.1 PATHWAYS 103
6.1.1 Project description 104
6.1.2 Justification of precedent study 104
6.1.3 Urban setting 105
6.1.4 Project objectives 105
6.1.5 Programme and planning 107
6.1.6 Design rationale 109
6.1.7 Conclusion 110
6.2 SAINT GILES 112
6.2.1 Project description 113
6.2.2 Justification of precedent study 113
6.2.3 Urban setting 114
6.2.4 Project objectives 114
6.2.5 Programme and planning 115
6.2.6 Conclusion 116
ANALYSIS AND DISCUSSION **117**
..... **117**
CHAPTER SEVEN: ANALYSIS AND DISCUSSION **118**
7.1 INTRODUCTION 118
7.2 ANALYSIS OF RESEARCH FINDINGS 119
7.3 DISCUSSIONS AND THEORETICAL IMPLICATIONS 123
7.4 CONCLUSION 126
CONCLUSIONS AND RECOMMENDATIONS **127**
..... **127**
CHAPTER EIGHT: CONCLUSIONS AND RECOMMENDATIONS **128**
8.1 INTRODUCTION 128
8.2 CONCLUSIONS 128
8.3 RECOMMENDATIONS 129
8.4 SITE SELECTION GUIDELINES 130
8.5 CONCLUSION 130
9. REFERENCES **131**

LIST OF TABLES

LIST OF FIGURES

Figure 1: *Timeline of universal design*

Source: *(https://extensions.joomla.org)*

Figure 2: *21st century technology helping the physically impaired be more abled*

Source: *(https://ciie.nl/news/global-high-tech-products-to-debut-at-china-import-expo)*

Figure 3: *Timeline of universal design*

Source: *(Author)*

Figure 4: The accessibility triangle

Source: *(https://libreas.eu/ausgabe6/002mos.htm)*

Figure 5: *Assistive technology assisting individuals with impairments with task they would not have been able to do previously*

Source: *(*https://gettecla.com*)*

Figure 6: *Blind Hindi students having computers read to them*

Source:(*https://www.jagran.coml)*

Figure 7: *The First industrial revolution, the age of mechanical production and steam power*

Source:(https://trailhead.salesforce.com)

Figure 8*: The second industrial revolution, the age of science and mass production*

Source:(https://trailhead.salesforce.com)

Figure 9*: The third industrial revolution, the digital revolution*

Source:(https://trailhead.salesforce.com)

Figure 10*: The fourth industrial revolution, the age of connectivity and the internet*

Source:*(https://medium.com)*

Figure 11: *The fourth industrial revolution emerging new systems*

Source:(*https://europeansting.com)*

Figure 12*: Smart cities, everything you need at your fingertips, allowing for the physically impaired to take charge of their lives*

Source: (*https://www.freepik.com)*

Figure 13*: Catagen, a building that is design with taking universal design principals into consideration, allowing for individuals in wheelchairs to interact with staff members as equals*

Source**:** *(* https://www.theguardian.com)

Figure 14: *Steps to understanding any social situation in order to come up with empowerment strategies that are specific to that social situation*

Source: *(Author)*

Figure 15: *Steps to understanding any social situation in order to come up with empowerment strategies that are specific to that social situation*

Source*:(Author)*

Figure 16*: any person who wants to help empower the disabled community needs to thoroughly understand the social situation from both perspectives. The physically challenged individual and the abled-bodied community.*

Source: *(https://lenity.com)*

Figure 17*: Sports as a medium to bring together the physically impaired with the full support of able-bodied individuals, engaging everyone and creating awareness in a vibrant environment that everyone is comfortable in*

Source: *(https://www.coe.int/en/web/sport/disability-sport)*

Figure 18*: Participant of individuals with physical impairments and abled bodied persons on a tour of the enabling village*

Source:*(https://development.asia/case-study/shared-space-bring-together-people-and-without-disabilities)*

Figure 19*: The enabling village Utilises for biophilic design and open spaces to allow for interaction in a comfortable environment*

Source*: (https://readthecloud.com,edit by author)*

Figure 20: *The enabling village public amphitheatre that caters for all individuals.*

Source: *(https://www.alamy.com)*

Figure 21*: Parkrun bringing a diverse group of individuals together*

Source: *(https://www.facebook.com)*

Figure 22*: Touch, Hazelwood school. A haptic experience. A textured wall for visually impaired students to feel as they move through the spaces*

Source: *(* https://architizer.com, edit by author*)*

Figure 23: *strandbeest self-propelled wind powered mechanism*

Source: *(https://www.wired.com)*

Figure 24: *Deaf space Gallaudet University space showing acoustic value, variation in texture, light and colour.*

Source: *(https://www.wired.com, edit by author)*

Figure 25: *Touch, Hazelwood school. A haptic experience. A textured wall for visually impaired students to feel as they move through the spaces*

Source: *(https://za.pinterest.com)*

Figure 26: *Japanese garden demonstrating the kinaesthetic experience. The visual sense stimulated through movement*

Source: *(http://www.japanesegardens.com, edit by author)*

Figure 27: *Synaesthetic filter by Stefan Rutzinger and Kristina Schinegger, the pavilion is designed to filter space visually and acoustically while maintaining a playful integration with its surroundings*

Source: *(https://www.dezeen.com)*

Figure 28: *A public space with seating. The atmosphere is enhanced by nature, light and the surrounding buildings*

Source: *(https://medium.com)*

Figure 29: *A public space with seating. The atmosphere is enhanced by the vibrance of the night, the people and the common activity which is the movie.*

Source: *(https://medium.com)*

Figure 30: *In the 21st century the atmosphere of spaces can be enhanced with technology like public lighting and new interactive furniture for streets and public spaces*

Source: *(https://www.hraadvisors.com)*

Figure 31: *An example of a sensory room used in the therapy for individuals with sensory impairments and autism*

Source: *(https://www.spacekraft.co.uk/)*

Figure 32*: A space with low light is more comfortable to be in and can create a focal point to draw the attention of the user's eye with greater ease*

Source: *(https://cgi.tutsplus.com)*

Figure 33*: Plinthos. A multisensory interactive pavilion that produces different levels of interconnected media to engage the user from multiple directions and allows them to be the performer and the user simultaneously*

Source: *(* https://www.archdaily.com)

Figure 34: *Nature helps speed up the healing process by putting the patient in a comfortable environment*

Source: *(* https://janneallaw.com)

Figure 35*: If the built environment is design by taking healing into consideration rather than efficiency then the built environment can aid in the healing process of an individual*

Source: *(* https://experiencelife.com)

Figure 36: *The social realm is a very important aspect in the healing and of an individual. The removal of the division between patient and staff should push beyond institutes of healing out into the reality of the world. This image shows disabled people being a part of a normal community and going about daily life just like everyone else*

Source: *(* https://lucielink.stlucie.k12.fl.us/disability-awareness/)

Figure 37*: A hospital corridor that's very static and depressing that can be seen as demotivational by the patient.*

Source: *(* https://za.pinterest.com)

Figure 38*: A hospital corridor that's utilizes different materials and takes into consideration multisensory design is seen as more vibrant and uplifting*

Source: *(* https://www.allthingsflooring.com,edit by author)

Figure 39: *Palo Alto polytrauma and blind rehab centre entrance*

Source: *(https://www.architectmagazine.com*

Figure 40: *Location of the Palo Alto polytrauma and blind rehab centre*

Source: *(www.googlemaps.com)*

Figure 41: *Palo Alto polytrauma and blind rehab centre entrance relationship between the two wings and the entrance*

Source: *(https://www.slideshare.net , edit by author)*

Figure 42: *Palo Alto polytrauma and blind rehab centre relationship with the rest of the facility*

Source: *(http://www.rhaa.com)*

Figure 43: *Section demonstrating solid and void between the two building wings*

Source: (*Author)*

Figure 44: *Ground floor plan circulation designed to be easy to navigate through*

Source: *(https://www.slideshare.net, edit by author)*

Figure 45: *First floor plan circulation doesn't form simple loops to allow for the user to learn to adapt to an environment that isn't conventional*

Source : (https://www.slideshare.net)

Figure 46: *Second floor plan circulation doesn't form simple loops to allow for the user to learn to adapt to an environment that isn't conventional*

Source: *(https://www.slideshare.net)*

Figure 47: *The garden is placed strategically, to invite the user to explore further. The garden allows for a number of activities.*

Source: *(https://www.slideshare.net, edit by author)*

Figure 48: *Circulation space is directly opposite the reception to allow the user to easily transition between spaces*

Source: *(https://www.slideshare.net, edit by author)*

Figure 49: *Custom designed acoustic ceiling that notifies the user of where they are through the change in sound reverberation*

Source*: (https://www.slideshare.net)*

Figure 50: *Custom designed acoustic ceiling that notifies the user of where they are through the change in sound reverberation*

Source: *(https://www.slideshare.net, edit by author)*

Figure 51: *Chris Downey reading plans that he had embossed*

Source: *(https://www.slideshare.net)*

Figure 52: *View of the Spaulding rehabilitation hospital from the outside*

Source: *(https://www.archdaily.com)*

Figure 53: *Location of Spalding rehabilitation hospital in its context.*

Source: *(www.googlemaps.com)*

Figure 54: *Vast open spaces and high volumes create a calmer environment for healing.*

Source: *(https://perkinswill.com)*

Figure 55: *good view of the exterior creates a calm atmosphere and helps the user in a faster recovery.*

Source: *(https://www.aiachicago.org/)*

Figure 56: *good view of the exterior creates a calm atmosphere and helps the user in a faster recovery.*

Source: *(https://perkinswill.com)*

Figure 57: *Custom designed pool to allow individuals with wheelchairs to engage in aqua therapy*

Source: *(https://www.archdaily.com)*

Figure 58: *A view of the green roofs from within the hospital*

Source: *(https://perkinswill.com)*

Figure 59: *All facilities are design using the principals of universal design to allow all users to utilize the facilities with ease*

Source: *(https://www.archdaily.com)*

Figure 60: *A welcoming entrance that incorporates nature*

Source: *(https://www.pathways-kloof.co.za/photo-library/)*

Figure 61: *The location of pathways*

Source: *(https://www.google.co.za)*

Figure 62: *Plan showing relation of classrooms, spill out spaces and circulation*

Source: *(Author)*

Figure 63: *A view of nature though the big panes of glass from the entrance*

Source: *(Author)*

Figure 64: *Wide well-lit corridors to allows for wheelchairs to easily move through spaces*

Source: *(Author)*

Figure 65: *A welcoming view from the entrance that incorporates nature*

Source: *(Author)*

Figure 66: *A view from the balcony to the garden*

Source: *(Author)*

Figure 67: *The playground that incorporates nature*

Source: *(Author)*

Figure 68: *Spill out spaces that feature a variety of texture for tactile experience, and a visual connection between the interior and exterior spaces*

Source: *(Author)*

Figure 69: *Wide corridors to allow for easy wheelchair mobility and pastel colours to create a calm environment*

Source: *(Author)*

Figure 70: *Location in context 4 Prince Street, point, Durban*

Source: *(https://www.google.co.za)*

Figure 71: *View from the road*

Source: *(https://www.google.co.za)*

Figure 72: *The charity shop at the entrance of the facility*

Source: *(Author)*

Figure 73: *Work centre where the physically impaired and able-bodied individuals work together*

Source: *(Author)*

Figure 74: *The work spaces allow for a lot of natural light to enter and create a more naturally lit environment to work in*

Source: *(Author)*

Figure 75: *analyzing all data collected*

Source*: (https://ceils.ucla.edu/event/ceils-discussion-group/)*

Figure 76: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

Figure 77: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source*: (Author)*

Figure 78: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

Figure 79: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

Figure 80: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

Figure 81: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

Figure 82: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

Figure 83: *(conclusion of findings).*

Source: *(https://www.dreamstime.com)*

PART ONE

BACKGROUND RESEARCH ON ISSUES

CHAPTER 1.
BACKGROUND RESEARCH ON KEY ISSUES



Figure 1: *Timeline of universal design*

Source: *(https://extensions.joomla.org)*

1.1 INTRODUCTION

1.1.1 Background

Transition into adulthood occurs when an individual moves from being protected and taken care of by their parents or guardian to being an independent adult. Every individual experiences this differently (Leonard et al., 2016). There are numerous factors that influence this change such as family and social relationships, career development or physical and cognitive development. Transition into adulthood is challenging for young individuals leaving their childhood behind and taking on new roles. The way the individual transitions into adulthood greatly affects their future quality of life.

For individuals with physical impairment, the transition into adulthood is comparatively more complex to their able-bodied peers. This difficulty in transition is largely attributed to the cessation of support services, rehabilitation, and facilities to cater for special needs upon a child turns 18 (Sung et al. 2016).

These individuals lack support to get them through daily life. They struggle with a changing society, making it increasingly difficult to develop the necessary skills. This results in an insurmountable unemployment rate of individuals with physical impairment in post-school situations which forces them to be dependent on their caregivers. Consideration should be placed on the population with physical impairments that are transitioning into adulthood (Sung et al. 2016).

Current research proves that the physical environment helps personal well-being. Thereby, the design of built environment can ultimately assist in the well-being and development of individuals with physical impairment. In present times, globalization presents new opportunities to individuals transitioning into adulthood. Globalization carries the transformative power of new technologies and new markets into the smallest of communities.

The clear-cut fact is that global forces are changing the world and restructuring way the next generation live and work. Rapid advancement in technology has presented itself through globalization. The technology of the 21st century is blurring the lines and fusing the physical world and the digital world. It is unavoidable and becoming a part of modern life.

A good example of this would be google GPS that suggests the fastest route to your destination because all devices are communicating with each other for your benefit as opposed to merely using a digital map.

21st-century technology is setting the groundwork for these changes in the way humans live. It has the potential to benefit to all people globally by increasing global income and providing a better standard of living. The effects of the 21st-century technology are not all good; according to Schwab (2018) 21st-century technology could lead to a more significant inequality, especially when it comes to labour markets. It could create separation in the work team whereby individuals ranked with low skill receive low pay and individuals with high skill get a higher pay jobs thereby increasing social tension. This where it becomes essential to prepare oneself and help to prepare those who cannot prepare themselves for an inevitable future.

Technological development has shaped the 20th century in various ways and will have a great influence in the 21st century. Technology should be understood, not as a global process but rather as many small separate incremental processes which transforms society and the way things are done over a period of time, benefiting its context in a variety of ways.

Technology should be used and understood incrementally as it can only be disruptive to individuals and organization who are not aware of it. There should be a balance whereby the shift to the technological age is in keeping with the rest of the world as well as modified to be contextually beneficial. This is why upskilling is vital to an ever-changing world.

The built environment is a part of all human activities which goes beyond where they live into places of work and recreation, thereby making it an influential part of daily life. At the centre of this man-made environment lies the relationship between perception and experience. The way people experience their environment is known as a process of perception. (Norberg-Schulz, 1965). This is how people start to develop relationships with their surrounding environments.

The environment can be adapted for individuals with physical impairments by using artificial intelligence (AI), virtual reality (VR), augmented reality (AR) and many other 21st-century technological advancements to assist the development a set of skills for their day to day lives. Thus, reducing the effect of the transition into adult hood for individuals with physical impairments or essentially providing a safe haven. This will create a ripple effect on how the user sets the formwork for the effects of the 21st century technologies.

1.1.2 Motivation/ justification of the study

Visitation of a facility that caters for children with special needs unearthed that their self-sufficiency was limited by a lack of awareness, funding, and trained professionals.

As stated in chapter two of the bill of rights of the South African constitution

"Everyone has the right-

(a) To a basic education, including adult basic education, and

(b) To further education, which the state, through reasonable measures must make progressively available and accessible."

This right contributes to the development of an individual. The department of basic education faces numerous shortfalls regarding this right. This has a ripple effect whereby individuals with physical impairments are not trained to sustain themselves in their transition into adulthood. Currently, there is no facility that can assist individuals with special needs at this stage. Apart from having such a facility, consideration needs to be placed on the way in which individuals with physical impairment learn and navigate through the environment.

This study will look at ways of alleviating the problems associated with the transitioning into adulthood for individuals with physical impairment. By catering to their spatial needs to equip them for day-to-day life or serve as a retreat for those in need of healing, fitness, recuperation, interaction, and socialising. The study will also carefully analyse how 21st century technologies can be used in conjunction with architecture to assist in the development of people with physical impairment.

The study will also investigate how 21st century technologies can assist in the social integration of individuals with physical impairment back into society and both locally and globally, as well as become a platform to create awareness, bonds, and support groups.

21st century technology can be both good and bad but due to the fact that it is the beginning of an era, a focus should be placed on the advantage that the 21st century technologies have to offer and how it can be moulded to create a user-centric system, thereby setting the groundwork for a technological future

1.2 DEFINITION OF THE PROBLEM, AIMS AND OBJECTIVES

1.2.1 Definition of the problem

Transitioning into adulthood is a vulnerable moment for any individual since they are expected to take responsibility for themselves. This is a very crucial time for them because their decisions in this time can have a lasting effect on the life they live. This transition is particularly difficult for individuals with any form of physical impairment, especially those that have not been equipped with skills to get by daily life, namely skills that relate to employment and being self-sufficient (Keller, Cusick and Courtney, 2007).

There is also a lack of nurturing environments to equip individuals with physical impairment with the skillset they require for daily life. This is due to a lack of spaces that are conducive for their development. These individuals utilize spaces and the built environment differently than able bodied people. These individuals who struggle to be a part of society as is, are further disconnected by not being given the necessary skillset they need to survive independently. It is essential to provide conducive, nurturing spaces for this group of people to gain the required skillset that is needed in the 21st century to function independently and allow them the opportunity to build a better life for themselves.

According to Sociologist Miller McPherson, Lynn Smith-Lovin and Matthew Brashears, social ties that are supported by technologies are fairly weak. They state that the internet and the availability of information from cell phones are the reason people are being pulled away from social settings and public interaction.

Technology, however, is a fantastic tool for the lives of the physical impaired. Research has shown that people with disabilities can show improvements in communication, independence and social interaction. This shows that people with impairments are more connected to the world around them (O Sullivan, 2015).

The main motive of technology, according to Thomas Friedman, is to tie the world together and not segregate it. Here, technology can be both positive and negative from a social standpoint. Thus, the aim of this research is to utilize the positives of globalization and 21st century technologies to create an architectural platform that allows for social integration by using technology in a public setting for people to use. This will break social and technological barriers that are associated with individuals with physical impairment as well assist the physically impaired in social reintegration using the built form.

1.2.2 Aims

The primary aim of this research is to critically analyze what considerations need to be taken by the built environment in order to be adapted for the use of 21st century technologies to assist the physically challenged in their transition into adulthood.

1.2.3 Objectives

- To determine if the built environment can be adapted in the 21st century to assist the physically impaired in their transition into adulthood
- To determine what spatial requirements the physically impaired need for skills development in the 21st century.
- To understand what effects globalization and technology have on the built environment.
- To investigate how architecture and technology can aid in creating inclusive environments.

1.3 SETTING OUT THE SCOPE

1.3.1 Delimitation of the research problem

The design of spaces greatly influences the way individuals learn and how they feel within that space. Every individual experience space differently. This study will focus on the influence architectural space has on education, skills development and physical well-being of an individual with physical impairment. This study will not delve into the curriculum of education that is required for special needs education for children or adults, but rather focus on the spaces in which these activities occur. The study will critically analyze the influence of the 21st century technologies on meaningful architectural spaces of learning and will be limited to Durban. The proposal aims to generate a set of guidelines that will be used when designing for individuals with physical impairments

1.3.2 Definition of the terms

1. **Disability:**

Generally, a condition either caused by accident, trauma, genetics or disease which may restrict a person's mental processes, senses or mobility.

2. Fourth Industrial Revolution:

A world where individuals move between digital domains and offline reality with the use of connected technology to enable and manage their lives (Schwab, K).

3. Artificial Intelligence (AI):

Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. The processes included learning (the acquisition of information and rules for using the information)

4. Virtual reality (VR):

is the use of computer technology to create a simulated environment. Unlike traditional user interfaces, VR places the user inside an experience. Instead of viewing a screen in front of them, users are immersed and able to interact with 3 dimensional worlds. By simulating as many senses as possible, such a vision, hearing, touch, even smell, the computer is into a gatekeeper to this artificial world.

5. Augmented reality (AR):

A technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.

6. Sense of place

Has been defined as people perceptions and experiences of an environment.

7.Architectural space:

Space has always been the spiritual dimension of architecture. It is not the physical statement of the structure so much as it contains that moves us.

8. Perception

Perception is defined as our recognition and interpretation of sensory information.

9. Assistive technology

Assistive technology is assistive, adaptive, and rehabilitative devices that are designed for people with disabilities and the elderly.



1.3.3 Stating the Assumptions

Spaces have a big impact on learning and fitness among individuals with physical impairments. It can be assumed that if designed correctly these spaces can enhance the learning and physical fitness capabilities of individuals with physical impairment It can also be assumed that with proper implementation, technology can be used to enhance the quality of spaces to aid in the well-being and education of these individuals. Thereby allowing them the opportunity to learn the necessary skills to use in their transition into adulthood.

1.3.4 Key Questions

Primary Question

1. How can the built environment be adapted in the 21st century to assist the physically impaired in their transition into adulthood?

Secondary Questions

2. What are the spatial requirements for the physically impaired to develop skillsets for the 21st century?
3. To understand what effects the role of globalization and technology have on the built environment?
4. How can architecture and technology aid in creating inclusive environment?

1.3.5 Hypothesis

It can be hypothesized that technology from the 21st century can be a means of providing a new model on how spaces are designed to improve learning for individuals with physical impairment to help them learn the necessary skillset they require for their transition into adulthood. The use of phenomenological architecture and the way that things are perceived is changing and can help with skills development and the well-being of individuals with physical impairment.

1.4 CONCEPTUAL FRAMEWORK

Before addressing the design of the built environment, it is important to understand how spaces have an influence on the way individuals with special needs feel and heal. The following literature review will critically analyse concepts and theories that will provide insight on how different individuals perceive and use space.

1.4.1 Theory of universal design

In the early 20th century people who had disabilities were a minority group. Back then most individuals with physical impairments or recurring medical conditions were institutionalised. In current times, people live longer. The current life span has increased from an average of 47 of 76 years. This is due to healthy living, good sanitation and vaccines for infectious diseases (The Denver post: 1998).

Advancements in the medical field has made it possible for individuals to survive fatal injuries and illnesses. This results in a population that has more disabled people than what the public realise. This changed the way that built environments need to be designed.

Public acknowledgement towards disabilities has increased in the last few decades but is still severely lacking locally. The barrier free movement began in 1950 to create opportunities in education and employment for disabled people. “Universal design is the design of products and environments to be usable by all, to the greatest extent possible without the need for adaptation or specialized design.” (Jay et al,2017)

Universal design was initially an architectural movement that dealt with social inclusion of people with physical impairments which then evolved into designing for everyone in mind. Similarly, the aim of technology was also to assist humans on all platforms, and, in many fields, they have achieved this, like in the medical field.

As technology advanced, it started to divide people socially. Universal design aims to achieve social inclusion across the spectrum, but it failed to consider the rapid advancements of the technology of the 21st century.

“The social changes that brought us to this point is increasing momentum and will propel us into the 21st century and will have to be more accommodating of individual differences.” (Molly et al.1998). This essentially means that, due to technology, the current social situation

was not considered when the principals for universal design was being formulated and thus needs to be more accommodating in this technological era.

By considering the positives that 21st century technology offers, universal design can impact individuals with physical impairment phenomenally. In additional to creating socially inclusive environments, it also assists them to gain skills that are beneficial in their daily lives.

The current term for one of the major changes socially and economically is globalization. Globalization is the manner in which people and the economy around the world are becoming more connected and are progressing towards a global culture, one that is integrated politically, economically, and culturally. It is allowing countries to carry out businesses globally. In the world today, globalization is an important concept for people to appreciate and understand. This is due to the demands of the business industry to employ individuals that can work with other nations and cultures.

According to Thomas Friedman, Globalization is not a choice. Friedman states that it is driven by technology which is to break barriers and tie the world together. Friedman believes that globalization is not only about trade, but rather about the thing's individuals choose to do. It is what technology empowers individuals to do. It is how individuals use these abilities to create intentions that can be beneficial.

This demonstrates how technology can be used as a platform to socially integrate individuals with physical impairment into society. It is also evident that the rapid advancement in technology and the way things are done is unavoidable. It then becomes essential to critically analyse and implement new methods of assisting individuals with physical impairment to gain skills for their transition into adulthood in this rapidly changing world. This is accomplished by improving the principals dictated in the theory of universal design using the technologies of the 21st century and implementing it in the built form holistically.

1.4.2 Empowerment theory

The empowerment approach would search for environmental influences instead of blaming victims. Empowerment requires an understanding of the social and health issues in order to bring about change and have a positive impact on communities. (Marc, 2012)

"We are at the beginning of a revolution that is fundamentally changing the way we live, work, and relate to one another. In its scale, scope, and complexity, what I consider to be fourth industrial revolution is unlike anything humankind has experienced before." (Schwarb, 2016)

This rapid advancement in technology poses many changes in the norm of how things are done. The approach to empowerment both socially and architecturally needs a new perspective to gain optimal results.

According to Aabha Brown there are 3 interlocking dimensions of empowerment. These levels are as follows

1. Self-Efficacy: Developing a positive sense of self.
2. Critical consciousness: Gaining knowledge and critical comprehensions the social and political issues of an environment.
3. The cultivation of resources or strategies for the benefit of personal or collective goals. Once the environment is understood as it is in depth, you can then develop strategies on how to make a change.

Empowerment is a process of change, but places emphasis on dealing with a current situation in order to move it into a reality that's more aspirational. The way a facility is designed has an effect on the recovery and healing of an individual with physical impairments.

Understanding social empowerment of individuals will then elaborate on this can be transformed into the built environment to create socially empowering spaces in the 21st century that allow for conducive healing and developmental environments.

1.4.3 Phenomenology

"Architecture is the art of reconciliation between ourselves and the world, and this mediation takes place through the sense" (Pallasmaa,1996)

According to Finnish architect Juhani Pallasmaa, the sense that is most dominant is sight. Humans rely on sight to understand and place themselves in their surroundings. By experiencing the world in this manner, humans become distant observers. By using the dominant sense of the eyes, humans, reintroduce a distance between ourselves and the object. It is when one touches one connects. "Touch connects us to the world. Touching and being touched is essential to our well-being" (Pallasmaa, 1996)

A space can look pleasing in an image but in reality, it may not be enough to make a person feel integrated with the environment. Scents, acoustics, materials, form, light, shadow as well as the light and proportion of things contributes to the spirit of the space and it overrules pure aesthetics.

According to Susan Fowler People who have any sort of disability may not have had the same opportunities as their able-bodied peers when it comes to experiencing and interacting with their environment. Activities that are focused on sensory stimulation help to provide an environment in which people with disabilities can have the opportunity to utilize their senses to interact with the world in a more meaningful way. (Fowler, 2006)

In the 21st century, advancements in assistive technology may reduce the difficulty of having a disability. Assistive technology helps individuals with physical impairments compensate for certain disabilities. This essentially helps with an individual's independence and reduces their need for support. This helps an individual with a disability experience an environment with less difficulty.

Heidegger suggests that through an architecture of phenomenology, one sees how individuals connect to the world, thereby helping to centre themselves there. This can strengthen the knowledge of a social aspect gained in the theory of empowerment. In reference to Juhani Pallasmaa and Martin Heidegger the aim is to provide an environment that stimulates the senses and creates a space that assists individuals with physical impairment and allow for the user to connect with the built form and stimulate all senses for healing and education.

1.5 RESEARCH METHODS AND CASE STUDY

1.5.1 Introduction

This section will outline the various methods used to carry out this research and specifies the intended scope of the study and indicates techniques that are used for gathering data for the research topic.

1.5.2 Research philosophy and strategy

The research methods which will be implemented in this study will be of a qualitative data collection by the means of primary and secondary data gathering. The interpretivist approach will be used to collect and analyse data due to the nature of the topic.

Qualitative methods will be carried out in the form of case studies and interviews in relative selected environments. All interviews and questionnaires will be a desktop study and will be carried out with the consent of the participants.

1.5.3 Secondary data collection

Literature will be reviewed in order to draw on relevant theories in response to the research question. Prominent authors will be researched and analysed in order to determine a direction for this thesis.

Literature review:

Analysis of theory via the literature review was aimed at answering the questions regarding individuals with special needs, the advancement in technology and how it can assist with this and an architecture of senses.

Precedent study:

The precedent will be analysed in line with the relevant concepts, theories and how it relates to the special requirements of individuals with special needs. The aim of the precedent is to help understand how architectural space can respond to the requirement of individuals with physical impairment at a global scale and how it can be adapted to suit the requirement of the south African context, more specifically Durban. The precedent will provide an architectural response to individuals with special needs and set the framework for the intervention.

1.5.4 Primary data collection

The primary data collection will allow for an understanding of first-hand experiences which in turn will test the hypothesis. This will entail observation, interviews and case studies.

Observation:

The observation method will be carried out in facilities that cater for individuals with physical impairment. The observation methods will help to gather data from the field by personal observation. It will be a systematic method of viewing and understanding how individuals with physical impairment engage with spaces. The advantage of using this method is that all data collected is current. The method of observation will be a structured method. This is about coming up with conditions of observing to make the selection of data easier as well as making way for factors that may not have been considered for the research. Data will be captured by analytical sketches and pictures There are two ways to gather data for observation: participation and non-participation. For consideration of the sensitivity of the individuals under care, the method of non-participation will be used

Interviews:

A combination of structured and in-depth interviews will be used to gather information. A structured interview allows for the analysis of data becomes more legible and a few standardized questions will be prepared. Combining this with the depth interview it allows for the researcher to digress from the prescribed questions and gain information about things he may not have considered thereby giving a broader understanding of the topic. A in depth interview is to explore the needs of the individuals from the caregiver or selected staff member of the institution. This requires a method of asking a question and a technique to understand the behaviour of the respondent. Due to the sensitivity of these individuals, the interviews will only be conducted with staff members and caregivers via electronic means of communication

Case study and sketch analysis:

Case studies will allow an interaction with the staff members or caregivers of various different people that are related to the study. The selected case studies will be analysed according to the theoretical background of the topic and be expressed and analysed in terms of architectural sketches.

1.5.5 Research materials

The primary research materials will involve documentation of background and current situations of the disabled people that the project will be design for. Photographic data will be gathered to document current spaces.

Secondary research materials will be determined from the literature review concepts and theories. This research will be carried out through the research of books, journals and the world wide web and an analysis will be undertaken to determine how they can be relevant.

Sketches, photographs, and field notes of the selected case studies will also be used.

The semi-structured in-depth interview is a way of gathering first-hand information from relevant participants. The interview will be intentionally designed to digress to allow for additional information.

Questionnaires will be used to gather and summarize information and be compared with the interview questions pertaining to individuals with special needs

1.5.6 Research analysis

The analysis of the studies will provide information of how appropriate environments used and how they should be designed. Recorded information will be put through qualitative analysis to determine the proposed design. This information will be in forms of drawings and photographs. Observational studies will be carried out in order to catalogue how the disabled people (if mobile) move and behave within spaces and if any discomfort or unease is experienced. An analysis of the information would then entail an anthropometric study to aid the design process of creating suitable spaces for peoples with physical disabilities to be able to learn the necessary skills they need for transitioning into adulthood. To ensure validity of this proposed study. The data collected will be thoroughly analysed with thematic analysis which is the most effective form of analysing qualitative data. The proposal will make use of researchers that have knowledge of the topic.

The key informants will be requested to grant permission for the recording of interviews, this is to ensure that all data captured is captured correctly.

To ensure validity of data, the study will make use of constant comparison, meaning that a single piece of information such as an interview will be compared to a previous interview and

not analysed on its own. This will enable the researcher to analyse the data holistically rather than fragmenting it. Constant comparison will also allow the researcher to pick up on unanticipated themes within the project. The study will intentionally seek for information that is contradictory to ensure that the researcher isn't bias in the study. The observer's expectations can greatly influence the outcome of the information that is being recorded. To ensure reliability in observations, a checklist will be created based on what needs to be observed in a non-biased way

1.5.7 Conclusion

One can see the positives of globalization and technology to the physically impaired in allowing them to experience spaces and places unlike before. It becomes essential to design spaces that are more conducive and inclusive to allow for comfort in these spaces to simplify the learning process. The aim is to incorporate technology and architecture harmoniously to contribute to alleviating the problem of the physically impaired being excluded from society and not having the skillset for the fourth industrial revolution.

1.5.8 outline of chapters

Chapter 2

Universal design. This chapter looks at how universal design had come about and how architecture can accommodate technology to make the lives of the physically impaired simpler as well as provide a more conducive environment for their development.

Chapter 3

Reequipping the disadvantaged for the 21st century. This chapter critically analyses the social problems tied to physical disability from all perspectives in order to provide a more informed strategy for an architectural solution.

Chapter 4

Empowering the physically impaired through multisensory design. This chapter looks at how sensory and multisensory design can be used to create a more conducive and user-friendly environments for individuals with physical impairments.

Chapter 5

After being informed by the literature review, this chapter looks at 2 examples of buildings that are designed for the physically impaired and how the implementation of the theories mentioned in the literature review can aid in achieving the objectives in the built form

Chapter 6

This chapter looks at 2 examples of local buildings that are designed for the physically impaired and analyses how the implementation of the theories mentioned in the literature review can aid in achieving the objectives in the built form.

Chapter 7

Analysis and discussion. This chapter looks at the analysis of the questionnaires and interviews that were conducted at the case studies mentioned in chapter 6

Chapter 8

Conclusions and recommendations. This chapter summarizes all the findings and set the guidelines for the design of a facility that caters for individuals transitioning into adulthood.

THEORETICAL AND CONCEPTUAL FRAMEWORK
CHAPTER 2. UNIVERSAL DESIGN



Figure 2: *21st century technology helping the physically impaired be more abled*

Source: *(https://ciie.nl/news/global-high-tech-products-to-debut-at-china-import-expo)*

CHAPTER 2: UNIVERSAL DESIGN

2.1 Introduction

"Designers are trained to design for a mythical group of people but in fact this group does not exist." (Story, Mace and Mueller,1998). In the world of design, nothing that is designed suits everyone perfectly. Every individual will, at some point, face difficulties with the spaces they dwell in or the products they utilize. This chapter will look at how universal design came about and how the built environment can accommodate 21st century technologies to assist the physically impaired in their transition into adulthood.

"Universal design can be defined as the design of products and environments to be useable to the greatest extent possible by people of all ages and abilities. Universal design respects human diversity and promotes inclusion of all people in all activities of life" (Story, Mace and Mueller,1998)

It is highly unlikely that any particular environment could be used by every single person in every single condition. It is therefore imperative to look at universal design as a process rather than an outcome. According to the data from the Census Bureau Survey of income and program participation (SIPP), which was done between 1994 and 1995, almost everyone will at some point in their life experience some sort of disability even if it is just temporary.

Due to natural reasons, disability increases with age. Many people deny having any form of disability due to the associated social stigma. In general, disability may be chronic or temporary like a broken arm, sprained foot or even the flu, as a result our lives are indirectly affected by certain products as well as the physical environment not being able to accommodate our limitations.

In the current world, longer life spans and a greater survival rate means more people are living with disabilities. There are also a large number of individuals who grow up in institutions that don't receive the skills that able-bodied individuals receive, making it harder for them to transition into adulthood, this being an addition to living with a disability. Due to this, universal design is becoming more and more important. As trends change, Universal design will evolve with new guidelines and design experience.

2.2 Evolution of Universal design

"Accessibility is a precondition for persons with disabilities to live independently and participate fully and equally in society." (Devandas, 2016)

One of the most important trends in the 21st century is Urbanisation. It has the ability to add to the redesigning and restructuring of our world and bringing about sustainable, inclusive cities. By the year 2050 6.25 billion people are predicted to be living in urban areas. Of this 6.25 billion people 15% will be people with some sort of disability. The way the urban environment is designed can either allow for or prohibit an inclusive society. In current times, individuals with impairments face a lot of challenges when it comes to participation in society because the environment does not allow for it. These barriers are directly related to the uneven rates of poverty and the exclusion that people with disabilities face, this in turn also has an effect on the development of communities as a whole.

If it is true that 15% of the 6.25 billion people would be staying in urban areas then it means that close to 1 billion people of city dwellers will have some sort of disability and this would bring about an unprecedented urban expansion that requires a transformation in thinking of what cities are and who they are for (Salman,2019).

In the past, it was generally perceived that individuals with physical impairments could overcome this disadvantage through adaptation based on a few individuals who were able to adapt. Despite public notions that all individuals that were suffering any sort of impairments could adapt, this was not true. Not all individuals that had impairments had the ability to adapt as well as others.

In the Greek period, impairments were viewed religiously. Individuals with impairments were considered to be facing punishment. Adaptation was essential because the physically impaired were abandoned if they failed to adapt. As time progressed, medical knowledge influenced the social perspective. Impairment could now be diagnosed into categories of either mental, sensory, cognitive or physical impairments.

With industrialization, the technical revolution like steel and concrete has allowed for greater possibilities. Designers are now allowed the freedom to think about the experience of spaces to bring the design closer to the user.



Industrialization itself also brought about a rise in impairments due to incidents in the factories caused by machinery, in addition to the veterans returning of from war.

In the 1950's, a new discourse both socially and scientifically arose, which made designers look for innovative ways to implement user participation through ergonomic design. This was to be inclusive of people with impairments as well. This brought in social researchers. Society was now being urged to see individuals with impairments in a different perspective. Changes in the built environment now became an objective to enforce this idea.

According to Froyen, simply designing to accommodate wheelchairs was designing for a very specific group and considered this to be a micro scale approach. In the 1920's, the legislation changed; impairments were no longer just an individual's problem but was now a society level problem.

Impairments were not just physical but also could be intellectual or mental as well. Barrier free design was the umbrella term that covered all of this. The post-modern discourse created a new human-centred design approach all over the world. Countries were now taking this into consideration.

According to Herssens, the idea was that individuals with impairments should not adapt to the built environment but rather the built environment should adapt to them. The macro approach was now to design the built environment for as many disabilities as possible.

As universal design emerged, the perceptions and interpretations varied in different geographical contexts.

In USA, the term was *universal design*. "An approach that incorporates products as well as building features which, to the greatest extent possible can be used by everyone" (Story, Mace and Mueller,1998). Many wrongfully assume that universal design is aimed at catering for the disabled. Universal design, however, aims to incorporate everyone regardless of the presence of a disability. Barrier free design is aimed at designing for individuals with disabilities.

In the United Kingdom the term was referred to as *inclusive design*. According to John Clarkson "By meeting the needs of those who are excluded from product use, inclusive design improves product experience across a broad range of users. Put simply inclusive design is

better." Clarkson states that when the term inclusive design emphasises the differences that exist among individuals which isn't always a good thing.

In Europe, the term was referred to as *Design for All*. According Grosbois, this is identical to the Vitruvian designed cities. Grosbois states that *Design for All* can come to be if you are able to achieve the following:

- Firmatas (Solidity and construction)
- Venstas (Aesthetic experience)
- Utilitas (Adaptation to use)

"Design for human diversity, social inclusion and equality, this holistic and innovative approach constitutes a creative and ethical challenge for planners, designers, entrepreneurs, administrators and political leaders." (Herssens, 2013)

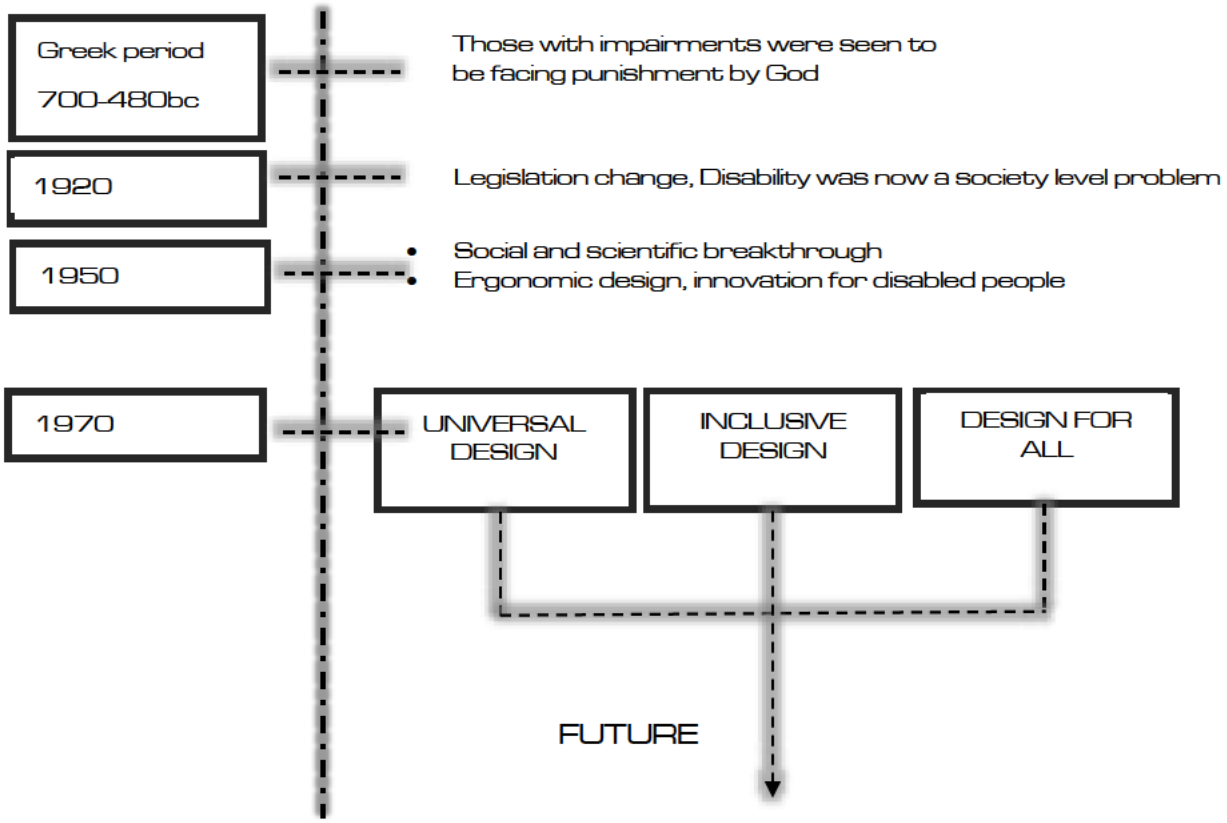


Figure 3: *Timeline of universal design*

Source: *(Author)*

The lack of a singular global term for this design approach causes confusion due to varying interpretations. It is important to note that one day in the future, the terminology for universal design will disappear similar to energy efficiency. It was once a specific objective is no longer in question as any built form must be designed to be energy efficient. Similarly, inclusive design may soon become a part of design thinking from inception.

To simplify Universal design, it should be seen as a necessity for some and a benefit to all. Universal design is about achieving an inclusive society whereby everyone has equal opportunities without the need for compromise. According to Nygaard Universal design should not exclude assistive devices which are required for certain individuals. Universal design is not a single solution that creates inclusion. It needs to be a combination of solutions. For example, in designing a library, to cater for the blind and the hearing impaired the library should have an induction loop as well as tactile paths.

The Accessibility triangle

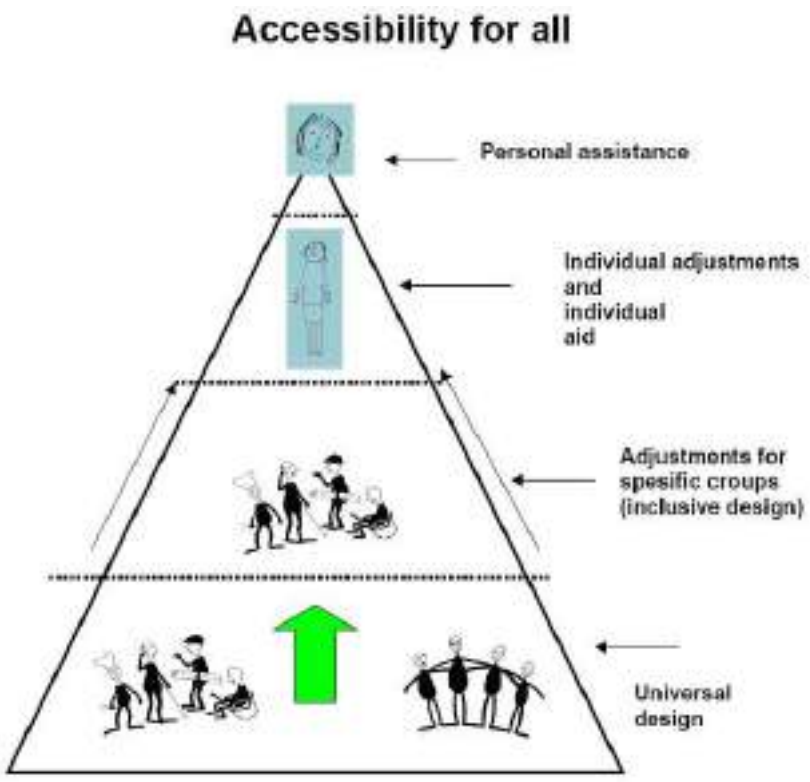


Figure 4: The accessibility triangle

Source: *(https://libreas.eu/ausgabe6/002mos.htm)*

This triangle illustrates 4 levels that is needed to be achieved for a building like a library to be accessible for everyone. The aim is to narrow the need for personal assistance and individual adjustments as much as possible. By pushing the boundary of universal design to be more inclusive it will reduce the requirement of the need of the next level. (Nygaard, 2018)

(Professor Lid as cited by Nygaard,2018) states universal design as a strategy is to create inclusive society for spaces for all people. Nygaard looks at two concepts, equitable accessibility and universal design. Nygaard states that it is important to use these two simultaneously. Essentially, design should allow for individual adaptation.

Professor Marie Lid also looks at universal design in the macro, meso and micro. Macro being things like ethics, values, and humanity, basically public perception. Meso being the technical solutions and micro being about the accessibility and the usability of the built environment. When taken into consideration these three levels will give a clearer understanding of universal design.

Nygaard goes on to explain the accuracy of the predictions that were made at the UD12 conference that he had attended.

1. The move from regulation to innovation. This shows a shift of meeting minimum requirements to designing new and better solutions. This is an important trend and a focus should be on research and innovation to help improve the quality of life not just of individuals with disabilities but of everyone. This should include the collaboration of the information's communications department as well.
2. Shift from accessibility to inclusion is to consider everyone rather than looking at detailed measure for a particular group of people. It is about creating a journey for everyone as well as encouraging participation.
3. Shift from barriers to sustainability. To look at universal design as something that is not just about an individual but about the entire community. Building a sustainable society where all individuals can participate, creating accessible societies through affordable sustainable transport systems and access to safe green public spaces.

To promote economic growth and equality for all people, individuals with physical impairments should be given the opportunity to obtain skills that will include them in job markets. Equal accessible educational buildings, inclusive learning environments. This can

benefit the younger generation and help to equip them with the necessary skills to make their transition into adulthood much easier.

2.3 The influence of physical impairments in the built environment

At the start of the 20th century, seniors and individuals with disabilities were a minority. For example, the average life span of an individual was roughly about 47 years, people who had any sort of spinal cord injuries only had a 10% chance of surviving. In today's world the average life span has increased to the age of 70 years, this is due to healthier living and vaccines (The Denver Post,1998).

Two world wars resulted in vast numbers of veterans living with disabilities. Antibiotics and advancements in the medical field allowed for people to survive illnesses and accidents which were previously fatal. Thus, the population is older and has more physically impaired than the general public realise.

The limitations of the built environment often go unrecognised but over the past few decades, acknowledgments of individuals with disabilities lean towards universal design. This developed to form 3 categories

1. Disability rights movement
2. Barrier free design to universal design
3. Advances in rehabilitation engineering and assistive technology.

According to Ndaba the American disability laws of the 70's, 80's and 90's was influenced by the civil rights movement of the 60's and prohibited discrimination against individuals with disabilities and allowed for access to education, public accommodation and transport. The barrier free movement of 1950, began as a demand of veterans and people with disabilities to allow for opportunities in education and transportation, rather than keeping these individuals in institutions and homes.

Physical barriers in the built environment were now seen as an obstacle to people who had difficulties in moving around. This proves beneficial for those individuals who are transitioning into adulthood. These individuals can now get into environments of learning or working with less difficulty, thereby improving the ability to earn despite their impairments and improving their quality of life.

In South Africa the SAHRC- South African Human Rights council has their own term for Universal design, they call it “Universal access”. South Africa embraces the concept of universal design as how the rest of the world embraces it and South Africa shows potential to learn from these countries.

Although it is important to learn from the rest of the world, local and domestic legislation is the most effective in aiding individuals with impairments. In the 1990s, South Africa had restructured disability to be reflected in a human rights approach. Since 1994, the government has taken steps in addressing how individuals with impairments are excluded from mainstream society. Government policies and legislation now promoted the rights of individuals with impairments.

South Africa is a member of the United Nations. The United Nations provides a standard set of rules on equalization of opportunities for individuals with impairments. The SAHRC and policy makers are guided by the minimum requirements set by the United Nations.

“South Africa is a democratic country since 1994 and the new constitution of 1996 brought about new laws which were essential for the disabled community. The South African constitution is one of the most progressive constitution in the world because it shows the struggle that most South Africans have faced” (Ndaba, 2003)

To address the social, economic, and political inequalities, the Integrated National Disability Strategy (INDS) which came about in 1997 carried out an extensive participatory process for individuals with impairments around the country and has provided a blueprint for the integration and inclusion of those individuals with impairments based on the results that they have obtained. The INDS supports the shift of dealing with impairments from one that is a medical model to one that is a human rights model.

According to Ndaba, the National building regulations aims to ensure that the buildings that are being designed are safe, healthy, and convenient for users. In part ‘S’ – “Deemed-to-satisfy rules” there is an interesting comment – “ a factor to be considered is that some of these facilities can also be of benefit to many who would not generally be regarded as disabled people” this indirectly shows the acceptance of ‘Universal design’ which aims to design environments that are imaginatively and seamlessly put into our environments to cater for the needs of different people, not just individuals with impairments but also for senior people, children, parents with strollers etc.

These are theoretically sound but need to be executed to be successful. According to the INDS planning professionals don't know the specific details when it comes to providing a barrier free environment. Development agencies don't have clear policies on environmental access. This results in many public buildings like schools and clinics being built with disregard for barrier free design. In South Africa, there is limited specialist expertise when it comes to barrier free access. Cost is also a major consideration for inclusion of barrier free design. However, when it is factored into the design from inception the additional cost does not exceed 0.2% of the total building cost as compared to access for all being an afterthought to design (Ndaba, 2003).

After the laws were set established and architects were complying with these standards, it was realised that any designs that were segregated in terms of access proved to be more expensive and majority of the time, it turned out to be less especially pleasing. It was also proven that inclusive design that considers individuals with physical impairments benefits everyone. The realization of this had set the groundwork for the universal design movement. (Story, Mace and Mueller,1998)



Figure 5: *Assistive technology assisting individuals with impairments with task they would not have been able to do previously*

Source: *(*https://gettecla.com*)*

Rehabilitation, engineering and assistive technology emerged mid-20th century. It was an effort set in place to improve prosthetics to assist the veterans that were returning from war. Assistive technology was applied to devices that assisted people with disabilities to help them function independently in environments that did not cater for their needs. Universal design and assistive technology have two different backgrounds but essentially have the same aim which is to reduce physical and attitudinal barriers between individual with impairments and those without impairments. Universal design aimed to integrate individuals with physical impairments back into the normative way of how things are and Assistive

technology aimed to meet the specific needs of these individuals (Story, Mace and Mueller,1998).

An approach that utilises both the processes of universal design as well employing newly emerging assistive technology can be used for the empowerment of individuals with disabilities. In addition, it will function as a tool to make transitioning into adulthood more manageable. A combination of these two approaches will also be beneficial to able bodied individuals.

2.4 The transition of Universal Design into a technological era

Technology is a powerful asset. It can help to alleviate the effects that the impairment may have on an individual. One example being: a wheelchair providing mobility to an individual who cannot walk. Since technology can assist the physically impaired, it is imperative to determine how technology can remove barriers and allow individuals with physical impairments equal opportunities as able-bodied peers.

In trying to alleviate barriers through the use of technology, there are two key questions that need to be asked:

1. In the workplace or a General public building, is it access or participation that is the obstacle for those who suffer from impairments?
2. Would technology reduce or eliminate that individuals' limitations for the task or participation in the workplace or public facility?

In the disabled community the term "Assistive technology" is becoming common and terms like "Rehabilitation engineering" or "Adaptive technology" are slowly fading away (Witt, 1991).

Assistive technology isn't necessarily high-tech. It can be a low-tech homemade device made to assist and combat the effects of a particular disability.

Shortly after World War 2, "tools and equipment" were used in the rehabilitation of veterans that were returning from war. In 1998, the congress passed the technology related assistance for individuals with disabilities act ("Tech Act"). this was when assistive technology came into being even though it did not appear in the "Americans with Disabilities Act". The tech act defines assistive technology as any device that is bought or made to help or assist improve the functional capabilities of individuals with disabilities. (Witt, 1991)

The world is being influenced by technology on a great scale. Technology greatly simplifies tasks. For a long time, technology has assisted individuals with disabilities in daily tasks, simple things like a walking cane, spectacles or even a prosthetic leg.

Assistive technology on the other hand are devices that are used to provide an alternate way of doing things. For instance, instead of having spectacles to read, computer software allows the computer to audibly dictate text (Witt, 1991).



Figure 6: *Blind Hindi students having computers read to them*

Source:(*https://www.jagran.coml)*

Another good example of assistive technology is a device that uses visual signals to notify an individual that their phone is ringing. It is important to consider that assistive technology is dependent of the individual. In some instances, it is probable that an individual may prefer personal assistance rather than assistive technology. For example, a person who is hard of hearing might prefer an interpreter rather than as assistive hearing device during a meeting (Witt, 1991). Experts say that personal assistance should not be substituted for assistive technology simply because it is easier for the individual. Assistive technology enables the user to take responsibility. A valued meaning of full involvement of a person with disability in decision making will result in the most effective solutions.

Examples of impairments and assistive technology solutions.

LIFE ACTIVITY	LIMITATION	SOLUTION
HEARING	Difficulty in understanding usable speech and differentiating between sounds	Written communications, Face to face communications
SEEING	Difficulty reading, writing or recognizing objects or faces	Non glare lighting, Maximum contrast. Signs with high contrast letters like white or yellow
SPEAKING	Only being able to speak in a soft tone	Emails means less need for speaking. A PC with synthetic speech output
INTEPRETING	Impairment in ability to perceive visual and audio information. Impaired memory ability	Maximise use of multisensory information paths, good quality spaces
MOVING	Head mobility, up, down and side	Swivel chair with adjustable recline
	Upper extremities, absence of limbs or complete paralysis	Large handle slide controls, non-slip surfaces
	Upper body impairments	Pull out shelves, mechanical Reacher's and wheel cart for carrying
	Lower body impairment	Appropriate chairs e.g., Height, size, arms, angle, and PC assistive technology

Everyone benefits when something is designed for a person with an impairment. For example, Curb cuts, were initially designed for individuals with wheelchairs but its benefits mothers with prams and even shoppers with trolleys.

When designing for accessibility there are 3 things that need to be taken into consideration

1. What are the natures of the facility?
2. What barriers restrict access?
3. Which assistive technology might reduce these barriers?

Signs

- Avoid hard to read fonts
- Include brail and large prints.

Lighting

- Eliminate harsh fluorescent colours
- Cover bare bulbs
- Avoid having lamps at eye level
- Have a minimum of 300 lumens in public spaces.

Décor

- Definitive contrast between joining areas
- Avoid dark colour schemes
- Avoid busy patterns

Sound

- Augment public areas with the visual equivalent
- Decrease multiple sounds
- Provide quiet spaces

Alarms

- Provide both aural and visual methods of systems
- Provide both aural and visual methods of exit systems

Aisles/Counters/Display

- Design spaces for easy mobility of wheelchairs



- Provide reachable areas

When designing anything, it is suggested to test everything by simulating the experience from the user's perspective. This can be done by restricting the sense of sight, audibility or using a wheelchair. People that have disabilities should test it too and note design flaws.

Although assistive technology is now spreading, people with disabilities aren't always aware that it exists, or they don't know how to access it. The task of an individual with a disability and their employer is to analyse the job to be done and match it to possible solutions.

The Future of assistive technology looks very promising. Those with impairments are better enabled now with the aid of assistive technology. In the future, more people around the world will have access to devices that are far more innovative.

The future has already begun to present itself, for example, the internet of things was not initially designed for individuals with disabilities but now provide them with control of all household appliances remotely. Cars for blind people are currently in its initial phases but a car that can be driven by blind people is in the process of being developed. Those who suffer from mobility issues currently have wheel chairs but even this form of assistive technology is advancing.

In today's world, assistive technology is the most useful tool that help special needs students that are transitioning into adulthood to live comfortably and independently. With the demand for 21st century skills, students and individuals in special needs educations should take advantage of existing assistive technology innovations. The assistive technology field is growing and becoming more innovative at a reasonable cost.

Those with impairments should not only utilize the devices but learn about them and be a part of the development, thereby not only getting employment but also being a part of the contribution that will allow for future generations to have a chance at employment.

2.5 Globalisation and the fourth industrial revolution: A new approach to universal design

"Industrial revolutions are revolutions in the systems that surround us, step changes in the complex interplay between humans and technology, and transformations that result in new ways of perceiving, acting and being." (Philbeck and Davis, 2018)

The Fourth industrial revolution and industry 4.0 are not the same thing but are very closely related. Industry 4.0 is a component of the fourth industrial revolution with its focus being the connection between digitalization, organisational transformation and productivity improvement in manufacturing and production systems. The fourth industrial revolution is the bigger framework and looks at the shifts in economics, politics and social issues. All these shifts are closely related to the rise of new technologies that span between the digital, physical and biological worlds.

According to Philbeck and Davis, the fourth industrial revolution displays the importance of the changes in market and employment trends and shifts in the balance of global power. The Fourth Industrial Revolution is said to be an extension of the third industrial revolution which brought about a rapid exchange of information which was only made possible by the third industrial revolution's digital technology. The third industrial revolutions technology relied on electricity and telecommunications which was made possible by the second industrial revolution.

It is important to notice and understand this evolution and the layering. In today's world the combinations of these "machine learning algorithms" and low-cost" sensors are making it possible for these technologies to be seamlessly added to our physical environment. Digital technology is now a part of daily life. The fourth industrial revolution should not be viewed as something that is "post-digital" but rather view it as "epi-digital" where the changes and innovations are built upon the digital foundations.

Technologies such as robotics, advanced materials, genetic modification, internet of things and so on are becoming a part of physical, social, and political worlds. Individuals are now changing dynamics such as altering behaviours and relationships. It is not just about technology or products that make life easier. The combination of all these things are restructuring the way worlds are experienced.

Before diving into the fourth industrial revolution, it is important to understand the history and the previous three industrial revolutions. Industrial revolutions are times of technological change and shifts in the system of power.

The First industrial revolution came about in the United Kingdom in the 18th century with the emergence of steam power. The combination of steam power and mechanised production created a transformation in output. This created an increase in productivity and growth of economies both locally and globally. With the rise of the middle class, it inspired scientific and technical pursuits and evoked new breakthroughs to learn more in new disciplines to push the boundaries.



Figure 7: *The First industrial revolution, the age of mechanical production and steam power*

Source:(https://trailhead.salesforce.com)

The second industrial revolution occurred between 1867 and 1914. It constituted a multitude of systems that enforced the idea that science and technology was the way forward for a better life. Entrepreneurs were now applying science to production; products were now a combination of science and engineering. This revolution brought a change in technical complexity and precision manufacturing as well as things like electricity grids and new forms of public transportation that was based on the combustion engine.

During the second industrial revolution, there was an emergence of other things like the steamship, telephone, gas turbine and also mass production. Things were becoming more mobile, goods were able to be transported internationally and at faster speeds and this set the formwork for the next industrial revolution, information.



Figure 8*: The second industrial revolution*

Source:(https://trailhead.salesforce.com)

Following the second industrial revolution was the third industrial revolution which happened after World War 2. The introduction of nuclear power formed the economic structure and that of the human place in the cosmos and natural world. Governments recognised the potential computers held for calculations and general use, this led to a progress toward an increase in computer power which in turn resulted in a more connected world. This set the framework for the fourth industrial revolution.



Figure 9*: The third industrial revolution, the digital revolution*

Source:(https://trailhead.salesforce.com)

Similar to the previous revolutions, the fourth industrial revolution brings opportunities not just for individuals but for industries as well. Artificial intelligence and the internet of things shows promise to an optimization of systems. Neurotechnology's are also rapidly advancing and may soon improve human cognitive and physical abilities that were just fictional just 10 years ago.



Figure 10*: The fourth industrial revolution, the age of connectivity and the internet*

Source:*(https://medium.com)*

The concept of the fourth industrial revolution is meant to help individuals and organisations make sense of the interplay between humans and technology. It is important to work with the fourth industrial revolution and not define it but rather understand it and shape the impact it will have on the future. There are 4 essential principals of the fourth industrial revolution that link new technologies to international relations: -

1. Focus on systems rather than technologies. It is important to mould and direct the new technology as part of a broader system and not individually. This requires a minimum understanding of fast-moving topics and the willingness to understand social and political impacts of these systems in the future.



Figure 11: *The fourth industrial revolution emerging new systems*

Source:(*https://europeansting.com)*

2. The second is to ensure that these new technologies empower people rather than direct them. Architecture can be a good platform to help in ensuring that these technologies empower people.
3. The third is to act holistically using designs. We have the privilege of being at the beginning of the fourth industrial revolution which means that we can shape the future rather than have it determined by these new emerging technologies.

4. The fourth is to ensure values and ethics are present. Technology is not just a tool. The ethics of technology must be considered both at development and at implementation.

The fourth industrial revolution should not be and is not an attempt to describe the past, present and future. It is to look in-depth and understand how our world is evolving and try to shape it into a future that will be beneficial to all. As the new world becomes an invisible one and becomes a cyber-system, a new way of thinking of technology is required to flourish the minds of humankind,

"We are at the beginning of a revolution that is fundamentally changing the way we live, work and relate to one another. In its scale, scope and complexity, what I consider to be the fourth industrial revolution is unlike anything humankind has experienced before." (Schwarb,2016).

There are 3 reasons why this revolution isn't like the previous revolutions and why it most certainly is not an extension of the third industrial revolution: -

1. Velocity- Unlike any of the preceding revolutions the fourth industrial revolution is advancing at an exponential rate.
2. Breadth and depth- It builds on the third industrial revolution but it is also leading to a paradigm shift. It does not only change the what and how of doing things but it is also changing who we are.
3. Systems impact- It is also transforming entire systems between society, companies and countries

Essentially there is no choice of "accept and live with it "or "reject and live without it" and since there is no choice, we should use this opportunity to create social models that these emerging technologies are enabling. By doing this, the chances of improving our world are far greater. Individuals must shape the fourth industrial revolution and ensure that it is *Human-Centred* rather that dehumanizing.

The fourth industrial revolution will affect all countries, sectors and people. It will also be influenced by all countries, sectors and people. According to Klaus Schwab it is important that all groups from around the world participate so that everyone can benefit from the forthcoming transformations.

According to Schwab the fourth industrial revolution is not just about smart and connected machines and systems. He believes it will be just as powerful as the previous 3 industrial revolutions but he does have a few concerns: -

- The required level of leadership is far too low in order to rethink our economic and social system to respond to the fourth industrial revolution
- The world lacks consistent positivity thereby challenging the fourth industrial revolution.

To put it simply- technological innovations are on the brink of fuelling change around the world. As much as there are a lot of positives that will emerge from the fourth industrial revolution, this era brings a lot of challenges as well. Inequality is one of Schwab's predictions. (Schwab,2016)

'Smart cities' depict one of the ways the fourth industrial revolution can bring opportunities for everyone. These smart cities show how different cities employ emerging technologies in the built environment to create social inclusion for everyone including individuals with physical impairments.

For example, moving through cities can sometimes be frustrating when dealing with transport delays and large crowds. The ability to move through the city, or any place for that matter, is often taken for granted. This is a luxury that not everyone has. Many individuals with impairments struggle with little tasks in and around the city such as accessing shops, getting into a bus and even crossing roads (Copp, 2018).

Smart cities strive to simplify daily life. The question arises, is a city smart if they cannot incorporate all groups of people. The *Internet of Things* and the new connectivity that are presenting themselves provides great opportunities for improving the quality of life for individuals with impairments. Cities need to utilize these opportunities and become more inclusive to prevent these technological advancements from dividing communities.

Almost 250 smart city leaders had admitted that their initiatives did not take disabled people into consideration. It is concerning that 15% of the world's population lives with some sort of disability and the leaders and planners of our future cities are disregarding these numbers. (Copp, 2018)

"We know that many, if not most, smart city solutions today are not accessible for people with disabilities. That is an enormous problem. All citizens should be able to benefit from the exciting smart city programmes and technologies. We think that there is a real need today to infuse the innovation process and urban innovation ecosystems with a much stronger focus on inclusion. A smart city that achieves digital inclusion for citizens with disabilities and older citizens will work better for everyone." (Copp, 2018)

Melbourne in Australia is a city that aims to create inclusion. One in five individuals in Australia have some sort of disability (Copp, 2018). In 2018 Melbourne ran an innovation competition in an attempt to make cities more accessible for individuals with impairments. Companies were encouraged to look at technological approaches for things such as accessible parking and wayfinding. The winner of the competition was Melba. This is an app which connects Melbourne's open data to smart assistants such as Siri, Alexa and google assistant to give the user current information in the form of texts or voice to help the visually impaired find their way through unfamiliar places like construction sites or places with heavy pedestrian traffic. The app also features a rating feature for food and beverages to assist the disability groups with certain information.



Figure 12*: Smart cities, everything you need at your fingertips, allowing for the physically impaired to take charge of their lives*

Source: (*https://www.freepik.com)*

Smart cities are currently failing to address the needs of the disabled. A survey that focused on 175 entrepreneurs in technology showed that only 43% of the participants had an understanding of their products but one third of the respondents were not sure if their products were user friendly toward disabled people.

In Australia there are 960 train stations that were intended to meet the accessibility standards but failed to. There are roughly 1.6 million Australians who suffer from disability and rely on public transport which constantly fail them.

In the UK 40 % of the railway stations are not accessible to the 11 million people that suffer from disabilities. This is due to flaws in the interior design, which fail to cater for the disabled and lack staff members that can help individuals with physical impairment with their problems of mobility.

Evidently, technologies have the potential to help individuals with impairments. However, considering these two countries, the success is dependent on planners' implementation and execution in the design of the built environment. It is also evident that the most problematic areas of inclusive design in the built environment is transport accessibility and mobility.



Figure 13: *Capitagreen, a building that is designed with taking universal design principals into consideration, allowing for individuals in wheelchairs to interact with staff members as equals*

***Source*:** *(* https://www.theguardian.com)

Some cities, such as Singapore, are heading the right direction. By the year 2030 one of five citizens will be over the age of 60. This is the driving factor of creating awareness on ageing and disability. CapitaGreen, located in the central business district of Singapore, is a 40-story office block, it has several awards for universal design. Designed by Toyo Ito, the building showcases column free spaces and low counter tops to allow physically impaired individuals

to navigate around the buildings. The building has a hearing induction loop to allow better communication with those with hearing aids. It has braille directions, tactile guidance as well as easy to read pictographs for the visually impaired. The lifts stay open for longer. Routes that link pedestrian walkways and transport systems to the office are also barrier free.

In the past decade, Singapore has been working on improving the accessibility of its Mass Rapid Transit (MRT). They have been adding more lifts, bigger gates, as well as tactile guidance's. Currently more than 80% of the stations have a minimum of two barrier free routes.

In Melbourne, Australia a scheme in trial is bringing about a transformation for the visually impaired. The scheme is in the southern cross railway station. It utilizes Bluetooth and free GPS on an app called blind square. Users get audio signals from their phones that give them direction based on real time information such as a disabled escalator. The app provides real time direction as well and on the inside of the building where the GPS signal may be compromised it uses Bluetooth beacons and users are still able to receive information. The trial is led by charity 'guide dogs Victoria' which also plans to implement this system

In looking at these examples, Schwab is proved correct that it is essential to shape and direct the emerging technologies now to ensure they are beneficial to everyone in the future. All these emerging technologies have the potential to make a huge impact, but in the end, it comes down the utilisation.

Numerous technologies are driving the fourth industrial revolution. Schwab has made a selection based on the research of the world economic forum and states that all innovations are only possible because of digital power, everything is dependent on computing power. In order to identify these megatrends, Schwab has split this into 3 categories: Physical, Digital, Biological, all of these being related in some way and benefit from each other.

Schwab states that the Physical refers to things that are tangible. These are things like Autonomous vehicles, Drones, 3D printing, advanced robotics or even new materials. Drones' usage will soon evolve; they will soon be able to deliver products such as medical supplies or even carry out tasks such as checking on powerlines. This provides employment opportunities for individuals with physical impairments. The training and execution are remote and require limited physical ability.

According to Schwarb, innovation is a complicated, social process so it is necessary to ensure that the advances are direct for the best possible outcomes. The world economic forum, in September 2015, states that when these technological shifts hit mainstream society - that's when it will become a tipping point. The impact it has, will determine how governments relate to their citizens and how enterprises relate to their citizens. This will be how these forces affect empowerment.

The fourth industrial revolution will also bring about unemployment splitting employers into two camps. The first being those who believe that the displaced workers will find new jobs and a new era of prosperity will emerge. The second being those that believe that it will lead to progress bringing about a social and political Armageddon. History however shows that the outcome will be somewhere in the middle of the two. Leaders will have to prepare their workforces and develop education models that will help in this new process.

According to Schwab, men and women will be affected differently in the fourth industrial revolution both bringing about a greater gender inequality. Both male and female job types are susceptible to automation but male dominant jobs that are at greater risk since the male majority that are usually on the field. This will decrease the earnings of 2 income families and increase the already problematic gender gap worldwide.

With that being acknowledged, it is important to note that this will drive people to learn new skills and will then enable workers to design and build alongside new technological systems. Gender inequality is not completely eradicated because males tend to dominate fields of computer science, mathematics, and engineering.

On the other hand, demand will grow for roles which machines cannot play a part in, these are usually jobs such as psychologists, therapist, and nurses. It is possible that female dominated jobs will remain undervalued and according to Schwab the fourth industrial revolution would bring gender inequality because it would not be able to leverage their talents in the workforce.

The outcome is unpredictable, all that can be said is a speculated possibility however we should look at the opportunities of empowerment and everyone needs to be prepared to ensure that these inequalities and the negatives of the fourth industrial revolution do not become a reality.

The impact that the fourth industrial revolution has on developing economies, is that the economy becomes a “winner takes all” dynamic and this will bring about social tensions and create a less cohesive world.

Looking at the positives, building’s purpose and usage become interchangeable. This will reduce the overall urban footprint, fragmentation, and social unrest. Considering this, one of the issues is how to accommodate modernity while still embracing traditional value systems.

It is important to create awareness in the early stages of the fourth industrial revolution so that everyone works together and creates a system that is not only modern but contextually cultural as well. The fourth industrial revolution affects every individual’s privacy and identity. it affects the time allocated to work and leisure, skills development as well as careers.

“The fact that we are always connected may deprive us of one of our most important assets, the time to pause, reflect and engage in a substantive conversation neither aided by technology nor intimidated by social media.” (Schwab,2016). Therefore, the treatment of built form is critical. The built form needs to allow for the user to constantly be bought back to reality in a natural and comfortable setting.

According to Klaus Schwab, in order to move forward we need to address the challenges brought by the fourth industrial revolution in 4 ways:

1. Contextual (the mind) - How we understand and apply our knowledge.
2. Emotional (the heart) – how we process and integrate our thoughts and feelings and how we relate ourselves to one another.
3. Inspired (the soul) – how we use a sense of individual and shared purpose, trust and other virtues to effect change and act towards the common good.
4. Physical (the body) – how we cultivate and maintain our personal well-being and that of those around us.

2.6 Conclusion

Globalisation meant businesses had to reorganize opportunities and challenges of the new arising global competition to remain successful. Customer markets and diversity of the consumer base were growing. Due to this global interaction, there was a difference in language, culture, experience and even design precedents. These differences contributed to the need for design to be sensitive and accommodating to individuals with different abilities.

"At the end of the 20th century the world is very different than it was 100 years ago" (Story, Mace and Mueller,1998)

The social changes that brought humanity to this point are increasing momentum. The changes going into the 21st century will need to allow for more differences. Universal design provides a blueprint for maximum inclusion of all people. This, however, is not sufficient for the rapid advancement in technology presented by the fourth industrial revolution. It is important to find a medium to create awareness of this rapid change so that as a global community, it can be ensured that this inevitable change has more positives than negatives for all human beings.

Perception changes in time, so does the way things are done, to evolve and become better and more inclusive. It should be considered how to take inclusivity to the next level in our current technologically driven era.

It can be concluded that assistive devices are benefiting those who suffer from impairments and that the built form is capable of accommodating technology that will assist in making an environment more universally accessible.

CHAPTER 3.

REQUIPING THE DISADVANTAGED FOR THE 21ST CENTURY

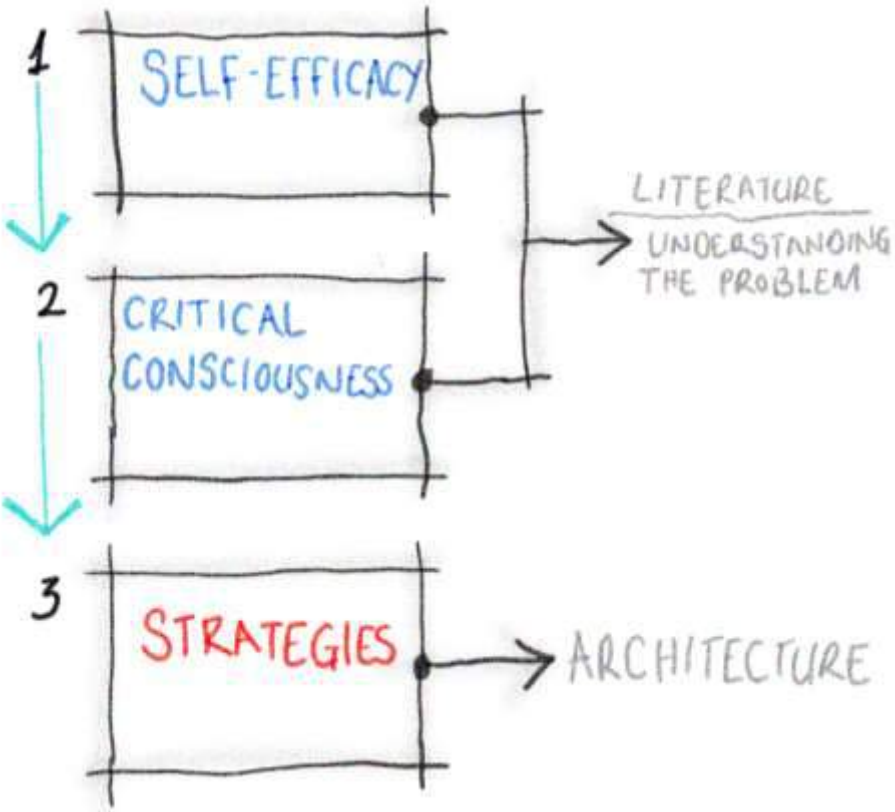


Figure14: *Steps to understanding any social situation in order to come up with empowerment strategies that are specific to that social situation*

Source: *(*Author*)*

CHAPTER 3: REQUIPING THE DISADVANTAGED FOR THE 21ST CENTURY

3.1 Introduction

Empowerment is about a process of change, but it must deal with a current reality in order to move it into a reality that's more aspirational.

Understanding how people can be empowered socially, will provide clarity on how the social situation can be transformed within the built environment to create socially empowering spaces in the 21st century that allow for conducive environments for healing and learning. This chapter looks at the problems attached to physical impairments from both perspectives, the physically impaired individuals, and able-bodied individuals to come up with design strategies that are more informed.

3.2 Critically understanding the disabled community

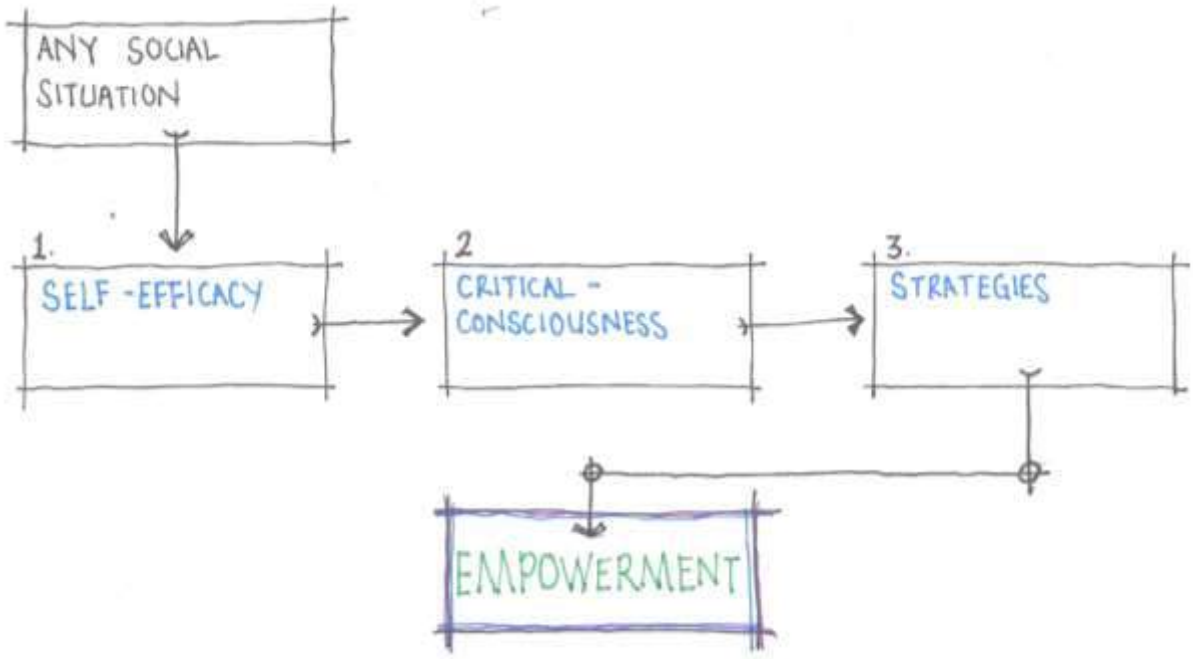


Figure 15: *Steps to understanding any social situation in order to come up with empowerment strategies that are specific to that social situation*

Source*:(Author)*

According to professor Aabha Brown, there are 3 interlocking dimensions of empowerment. These levels are as follows:

1. Self-Efficacy: Developing a positive sense of self. This requires an individual to become self-aware and understand their relationship to the social situation in a particular environment. It is important to fully grasp the difficulties individuals with physical impairment face with their transition into adulthood, not just in the skills they may lack, but also the social difficulties they experience. Along with understanding the social situation thoroughly, it is important to analyse the complexities of 21st century technologies and the impact it has or is making on the physically impaired.
2. Critical consciousness: Gaining knowledge and critical comprehensions the social and political issues of an environment. This requires a relationship with the environment as it stands and the individual cannot be frustrated about what's going on. This is simply for understanding the different perspective from a particular social situation. Essentially, an understanding is required from the perspective of abled bodied people with regards to how and why the physically impaired are socially left out and struggle with employment. It is also important to view 21st century technology impartially and fully understanding the impact it has on all individuals.



Figure 16*: any person who wants to help empower the disabled community needs to thoroughly understand the social situation from both perspectives. The physically challenged individual and the abled-bodied community.*

Source: *(https://lenity.com)*

3. The cultivation of resources or strategies for the benefit of personal or collective goals. Once the environment is understood in depth, one can then develop strategies for change. Strategies for assisting and empowering individuals with physical impairment, both social and the built environment, requires an understanding of the associated challenges of transitioning into adulthood from all perspectives.



Figure 17: *Sports as a medium to bring together the physically impaired with the full support of able-bodied individuals, engaging everyone and creating awareness in a vibrant environment that everyone is comfortable in*

Source: *(*https://www.coe.int/en/web/sport/disability-sport*)*

Considering professor Aabha Browns' three interlocking dimensions of empowerment, the transition into adulthood for everyone is a difficult time. For those that suffer from any form of impairments - this transition is significantly more difficult than able bodied individuals. It is between the ages of 16 and 24 that these changes are most prominent. The changes may affect the people around those going through the transition as well, like family members and friends.

This is particularly challenging for those with impairments. Individuals with impairments faces difficulties from a young age, in school or making career choices, they face difficulties in tertiary education as well as finding independence. They experience relationships and discrimination differently.

Upon turning twenty-one, these issues become amplified because due to loss of support such as the therapy they may have received in school. Numerous programmes, such as special education programs. terminate when these individual's turn 21. The termination of these programs often put these individuals in a difficult spot. In addition to losing support, these

individuals are also taking on new challenges at the same time. Among the challenges that these individuals face are issue of employment, social acceptance and integration as well as family and caregiver issues (Sullins, 2019).

According to (Sullins,2019), finding a job is a big challenge for adults who suffer from any sort of impairments. Majority of individuals with impairments are unemployed simply because they cannot get the training needed to get a job. Many individuals who manage to get jobs are paid below the minimum wage. Tertiary education also plays a role in this because certain jobs require tertiary education.

When these individuals' transition into adulthood, it can become a full-time job for the family because they lose the support they were getting prior to their coming of age. Several individuals who don't find employment stay at home with their caregivers.

According to rise blog, almost everyone has some difficulties at some point in their lives but individual with impairments encounter more barriers personally and environmentally. Barriers may include:

- An inaccessible environment
- Lack of assistive technology to assist the impaired
- Negative attitudes in the workplace
- Lack of systems, policies and services.

Physical barriers are barriers in the environment that obstruct functions such as the lack of a ramp or elevator that restrict access. Negative attitudes, such as judgements or assumptions toward individuals with impairments can prevent them from getting hired or affect the experience they have at work. This can lead to stigmatization and discrimination.

Communication can also pose as an obstacle, for instance, the inability to read, write or speak in order to get a particular job done. Employers need to be mindful of these obstacles and provide the necessary assistance where it is needed.

It is evident that individuals with physical impairment face difficulties from a young age and it is also difficult for them to find employment. It is important to look at the difficulties that they face once they find a job. According to professor Aabha Brown, it is important to critically understand the social issue thoroughly before attempting to find a solution and bring about change.

It is already common knowledge that individuals with impairments face a lot of difficulties with employment. Insider has spoken with individuals with different disabilities for a clearer understanding of the exact difficulties that individuals with impairments face in the workplace.

One of the interviewees has an abnormality called symbrachydactyly. This particular individual left hand did not develop. Despite having a master's degree and being a professional, people only see a disability which is a constant reminder of being 'different'. This individual had told Insider that even the human resource executive looked scared when they saw her hand. Receiving those reactions from an HR office would provide little comfort regarding the expected reaction from colleagues.

One individual has bilateral hearing loss so she is considered to be hard of hearing. She is a fully able and capable individual the only difference is that she cannot do is hear without the assistance of hearing aids. Unfortunately, her capabilities are often overlooked. She says that many times people have assumed that she could not perform a specific task and she had to work twice as hard just to prove that she is deserving of the same treatment as her colleagues. Although she is capable of proving herself and her abilities, she states that it is very exhausting to constantly have to prove her worth.

According to SE Smith in the obituaries of the high-profile people with impairments you usually see words like 'Overcome' or 'in spite of their disabilities', these are used to describe people with disabilities who were still able to achieve success. These high-profile individuals with impairments are often role models because they lived fulfilled lives whilst having a disability.

It often goes unnoticed that some high-profile individuals with disabilities are born into privileged families. As a result, they were able to overcome their disabilities obstacles by being able to attend good schools and had jobs in the family firm. In some instances, they had the opportunity of their homes being modified for access and could afford mobility assistive devices. They were able to succeed as disabled people because they had an advantage which not all disabled people have.

While it is beneficial for these high-profile individuals with disabilities to be pegged as role models. Communities and society need to assist individuals with physical impairment to achieve goals and become more 'abled' like the very role models they look up to.

Stephan Hawking, one of the well-known high-profile persons with disability, spoke on behalf of the disabled people that cannot be heard. Hawking, a well-known scientist who passed away on 14th March 2018 at the age of 76 years old, suffered from an incurable condition called Amyotrophic lateral sclerosis (ALS).

He was diagnosed with this condition at the age of 21 so he was not disabled throughout his life. Hawking had an extraordinary mind that was trapped inside a paralyzed body. He required a synthesizer to be able to verbalise. He was probably one of the few famous individuals to make use of the high tech 'augmented and alternative communication (AAC). He had influenced a lot of people with disabilities.

Despite Hawking's condition, he was able to marry and father three children, write books and work into old age. Hawking lived life the best way he could and accepted himself as he was. He struggled and had problems but also worked hard for success. He was well known for his work but was also admired for his ability to rise above circumstances and participate no matter the difficulty of the task (Rawlins, 2018).

Frances Ryan states: "Growing up disabled in Britain, I didn't have many role models. There are hardly any statues of disabled leaders, no great lives with chronic disability documented in the history books. As a child, it's easy to believe that disabled people have never really existed, and that when they did, it was as cripples to be pitied or burdens on society. Hawking provided a brilliant, witty, kind figure – who confounded the negative stereotypes and the low expectations so often forced on those of us with a disability" (Ryan, 2018).

Hawking acknowledged that his success was largely attributed to his privileged background. He acknowledged that he was afforded opportunities that most individuals with physical impairments were not. Opportunities such as wealth and healthcare as well as the fact that he was not disabled through his schooling career. In UNESCO's international conference in 2014 he stated how very different his life would have been if he didn't have those technological devices to assist him. In a video message for UNESCO's conference he states that his communication device was non-functional for three days and he was shocked at how powerless he felt and concluded by saying:

> "I want to speak up for people who live their lives in that state…We need to make sure this technology becomes available to those who need it so that no one lives in silence. Please listen to me. I speak for those you can't hear." (Stephen Hawking's, video message for the UNESCO New Delhi Conference 2014 English subtitles, 2016)

Technology is now much more readily available. Using technology and creating awareness about disabilities will ensure it is easier to empower those who suffer from impairments and create a social inclusion.

Buildings that allowed for more interaction with individuals with physical impairments would create awareness of disabilities. Society would be more comfortable and less biased toward the disabled community.

Stephan Hawking's comment can be addressed in the built form by creating spaces of engagement. The biggest issue is awareness and architecture are a platform that can create awareness on the physical, social, and economic spheres. By designing buildings that are sustainable and self-funding would allow the funds generated could then be used to make these new technologies more easily available to the public

Analysing the daily difficulties and obstacles in the workplace that individuals with impairments face makes evident the difficulty of transition into adulthood for these individuals. According to professor Aabha Brown, points of empowerment, in order to move forward towards a solution, it is essential to understand the social situation thoroughly.

Research has been done on the difficulties that individuals with disabilities face whilst growing up and in the workplace, which gives an indication of the severity of the transition into adulthood. It is now essential that disability be looked at from the perspective of the able-bodied people. This it to fully grasp the extent of the social situation from both perspectives so that the methods for empowerment and change is one that is well informed and benefits everyone.

About 67% of people feel uncomfortable when they have to interact with an individual with any form of impairments. According to Frances Ryan, this stems from ignorance and fear and it may require time, money and a great deal of effort to change attitudes. The discomfort can be attributed to fear inappropriate comments or difficulty in social engagement.

67% of people, that is a huge number. According to New statesman magazine, about one-fifth of people between the ages of 18 and 34 avoid talking to individuals with impairments because of the uncertainty of their ability to communicate with them. It would be simpler if people understood what living with an impairment is like. It is a result of lack of awareness.

According to Frances, "awkwardness stems from fear, of course – from being separate from something and then suddenly having to deal with it. It's the natural biproduct of a society that excludes the disabled." (Ryan, 2014)

Creating more inclusive spaces that combine work training, retail and lifestyle will allow for the integration of individuals with physical impairments back into society. Not only will it empower and integrate them back into the community, but it will also break stigma. It will educate individuals who are unaware of the social issues attached to disability and create a more inclusive, welcoming environment. The strategy to combat the social situation discussed is to make the environments as inclusive as possible and allow for interchangeable activities. Allowing spaces for conversation and interaction will dissolve the discomfort between disabled and able-bodied individuals.

3.3 Empowerment as a process for social enhancement

Empowerment for individuals with disabilities is essentially about creating socially inclusive environments where diverse individuals, especially those with disabilities come together and feel a part of the community and society.

A good example of how the built environment is used to empower individuals with disabilities is the 'Enabling village' in Singapore. It combines education, work training, retail and lifestyle and allows for integration of individuals with physical impairments back into society.



Figure 18*: Participant of individuals with physical impairments and abled bodied persons on a tour of the enabling village*

Source:*(https://development.asia/case-study/shared-space-bring-together-people-and-without-disabilities)*

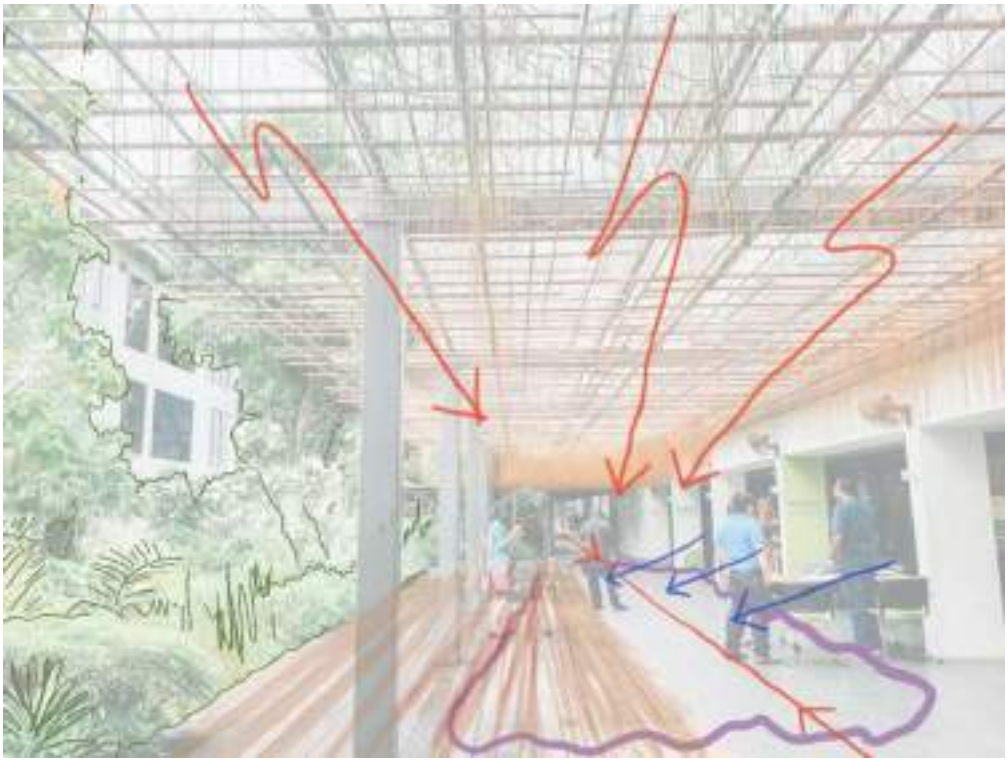


Figure 19*: The enabling village Utilises for biophilic design and open spaces to allow for interaction in a comfortable environment*

Source: *(https://readthecloud.com,edit by author)*

The *enabling village* uses spaces for the formation of community. The holistic design fuses architecture, 21st century technology and lifestyle to create spaces and events that promote participation for all individuals, not just those with disabilities, resulting in a well-integrated society. The building employs universal design principals to ensure it is completely accessible to everyone. The enabling village prepares individuals with disabilities for employment by training them. Often the staff at the facility also have disabilities.

On site, architectural design studios, retail stores and art galleries cater for individuals with special needs by displaying their skills and help them communicate with other artists and develop their skills. The village empowers individuals with disabilities by helping them learn how to utilize assistive technology devices as well as features a room that allows them to test assistive technology devices before purchasing them.



Figure 20: *The enabling village public amphitheatre that caters for all individuals.*

Source: *(*https://www.alamy.com*)*

It is of utmost importance that all spaces are able to uplift those with disabilities and are inclusive to all individuals. In essence, empowerment in the built form comes through the creation of spaces for all, that are enhanced by events that bring people together. These events and activities can only truly be successful in empowering people if the built form allows for it.





Figure 21*: Parkrun bringing a diverse group of individuals together*

Source: *(*https://www.facebook.com*)*

Public open spaces that allow for activities of many people from different backgrounds can also be seen as a space of empowerment. One of the trending weekend fitness activities is known as 'Park-run'. Park run is a 5km run/jog/walk. It is an international activity that takes place at selected venues in almost every city around the world. This is a non-competitive activity that occurs every Saturday at 8am. In Durban there are several places such as North beach, south beach, Umhlanga, Blue lagoon etc, where parkrun takes place.

Activities like this demonstrate how a common platform can bring people together on a large scale. Every Saturday morning, individuals attend this event not just for fitness but also for its vibrant atmosphere. A lot of senior people walk the 5 kilometres while engaging in conversation with their family or make new friends. Many physically impaired individuals in wheelchairs also participate, creating one big diverse community. Individuals with physical impairments also bring their pets along to simply walk and enjoy the atmosphere while working on their fitness.

Park run is a good example of how people with a common interest can transform any space into a place of upliftment and empowerment. Socializing is the essence of comfort and indirectly creating awareness to break social stigma attract more individuals to become a part of physical challenged society.

3.4 Conclusion

According to professor Aabha Brown's views on empowerment, it is important to first, understand a social situations relationship to an environment and then be critically conscious by gaining the necessary knowledge of the social issue. Once the social situation is understood thoroughly, then only can management strategies be formulated.

In this chapter, research has been done to understand the relationship that individuals with physical impairments face in the built and social environment around them and when transitioning into adulthood. To gain thorough insight on the issue, research was done from the perspective of individuals with physical impairments as well as the point of view of able-bodied individuals.

It is evident that individuals with physical impairments face many difficulties in transitioning into adulthood and that cutting-edge technologies of the 21st century can be used to assist them in their transition. A few of the biggest problems that need to be addressed are; accessibility to buildings such as workplaces, stigma and general public attitude toward individuals with physical impairments.

The way forward is to create awareness on a common platform for both physically impaired and able-bodied individuals while also encouraging interaction via a multitude of activities and events in inclusive spaces.

CHAPTER 4.

EMPOWERING THE PHYSICALLY IMPAIRED THROUGH MULTISENSORY DESIGN

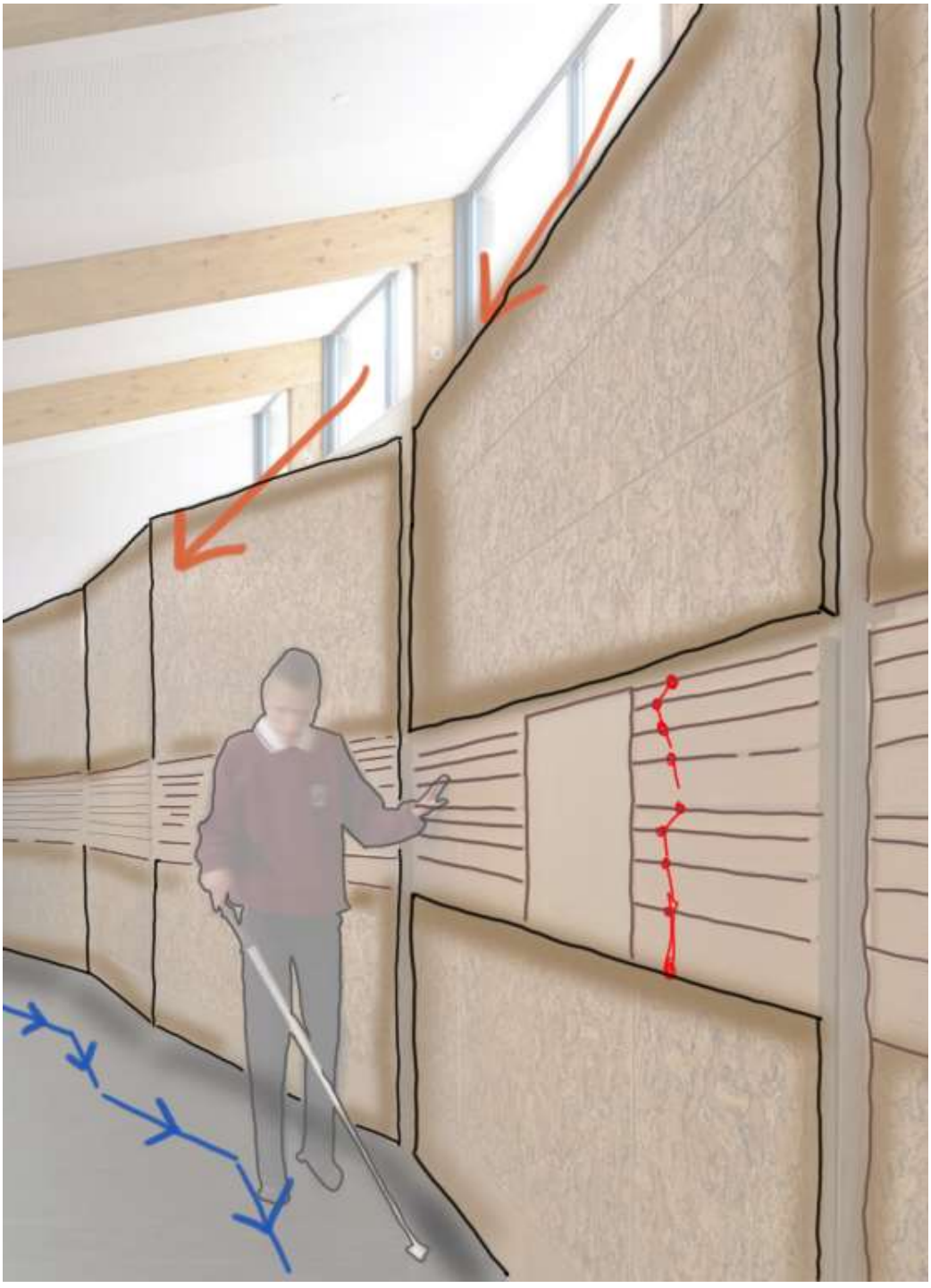


Figure 22*: Touch, Hazelwood school. A haptic experience. A textured wall for visually impaired students to feel as they move through the spaces*

Source: *(* https://architizer.com, edit by author*)*

CHAPTER 4: EMPOWERING THE PHYSICALLY IMPAIRED THROUGH MULTISENSORY DESIGN

4.1 Introduction

This chapter looks at how the combination of senses affect the way individuals engage and interact with their surrounding environments. Stimulating one's senses ensures that the built environment can be experienced holistically.

Every being should be granted the opportunity to be fully integrated into their environment to experience it using available senses regardless of their impairments. Designers often favour the visual sense, failing the opportunity for sensory environments and depriving those who have visual impairments.

Humans generally rely greatly on the visual sense. The experience of a space can be influenced by different colours, patterns, sizes and lighting yet can be enriched with the introduction of sound into a user's interaction. Sounds don't necessarily have to be intentional, but it could be the noise of other users as well. Acoustics play an important role in enhancing the quality of sound in that space. The way things feel can also have an effect on the experience of a space. Changes in materials or varied textures allow users to be more integrated with and connected to the environment.

Understanding how senses are stimulated and interconnected will allow professionals to create a more inclusive and multisensory experience that allows for the healing and development of individuals with impairments to occur with greater ease. This will also steer the professional away from designing an environment that is favoured by sight as well as allow for the designer to understand the spatial requirements of the physically impaired.

4.2 How sensory design influences the built environment

Sensory design has gained popularity in the last decade. However, the ideas behind sensory design began in the 1950's in art collectives in Europe and in Japan. The artists had realised how limited their art was when it only stimulated sight. This new approach to art aimed at using the full sensory spectrum. These ranged from the basic light, sound, reflection, and optical illusions to things such as live explosions, slicing and burning.

In modern times, strandbeest wind powered mechanisms can be seen as interactive artwork. It is a clever system of mechanics that utilizes wind power to move on its own.



Figure 23: *strandbeest self-propelled wind powered mechanism*

Source: *(https://*www.*wired*.com*)*

Now there are firms such as DS+R that innovatively use technology to intensify exhibitions. According to Alice Bucknell, this does not mean that architects should look at technology as building bricks. Materiality is still the core of sense but when looking at the physically impaired, multisensory design has a real-world significance. Deaf space is a good example of this. They look at a new design language to create a more inclusive environment for the deaf society. The use of light, colours and materials help with their instinctive abilities to connect with people. In this building multisensory design helps to bridge the gap between the hearing and the deaf communities.

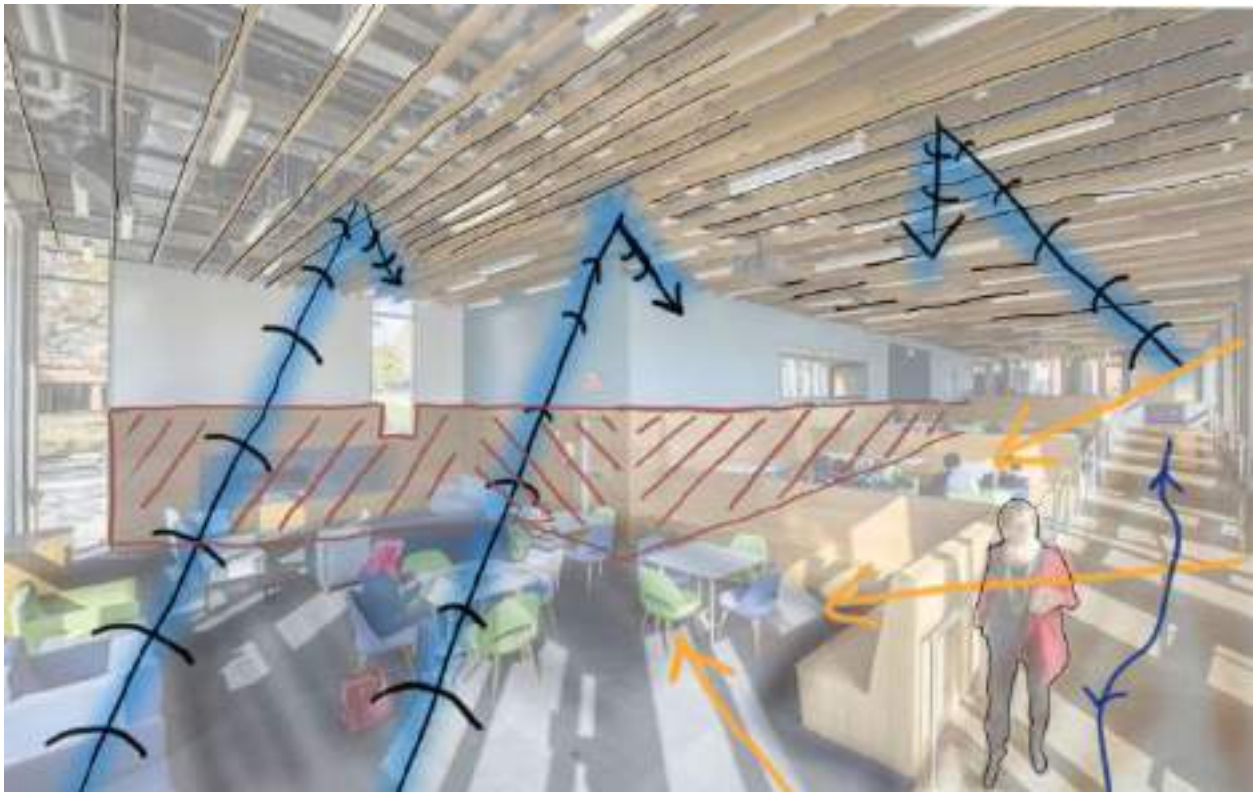


Figure 24: *Deaf space Gallaudet University space showing acoustic value, variation in texture, light, and colour.*

Source: *(https://www.wired.com, edit by author)*

It has been done in Deaf Space's Gallaudet University in Washington; this means that this technique of design can be used in institutes that cater for individuals with any kinds of impairments. Presently, sensory technology such as augmented reality and virtual reality is almost as available as a laptop or cell phone. One can currently transport oneself to be in any part of the world while remaining in their physical location.

"Technology is creating new opportunities for designing sensory experiences, but it can also diminish our sensory engagement" (Bucknell,2018). It is the duty of the professional to guide usage of technological advancement to ensure it is creating inclusive environments. It is evident that technology can help individuals with impairments as there are several new assistive devices now. It is of utmost importance that technology not be ignored but utilized in a way that it can improve the lives of the disabled and create a better future for them as well as those around them.

Human's experience using their five senses. "The experience and the process of the information given by the senses can be understood in three terms: Hapticity, Kinaesthesia and Synaesthesia." (Berg, 2014)



Figure 25: *Touch, Hazelwood school. A haptic experience. A textured wall for visually impaired students to feel as they move through the spaces*

Source: *(https://za.pinterest.com)*

When an individual comes into physical contact with an object, it is referred to as a haptic experience. However, the haptic is more than merely the act body and object meeting. A haptic experience conveys more information and isn't as two dimensional as 'touch'. A haptic experience is a 3-dimensional understanding of an object or one's environment (Gibson as cited by Kreij,2010).

This 3 dimensionality makes its movement an important action. It implies a sense of exploration to the simple act of touching. Touch is no longer a sense ,but rather a very powerful system of perception (Gibson as cited by Kreij,2010).

Kinaesthesia is a combination of the visual sense combined with movement and experience through time. The Kinaesthetic experience is made up of different senses and how an individual experiences an environment while moving through it and connecting to it with their different senses. Senses are connected to emotions; the senses receive stimulation then send the information to the brain causing emotion. Kinaesthesia is about bodily movements; this is where the relation to architecture steps in because architecture requires movement to be fully perceived by its user. This movement doesn't necessarily mean walking; it could relate to the movement of the head or of the eyes.

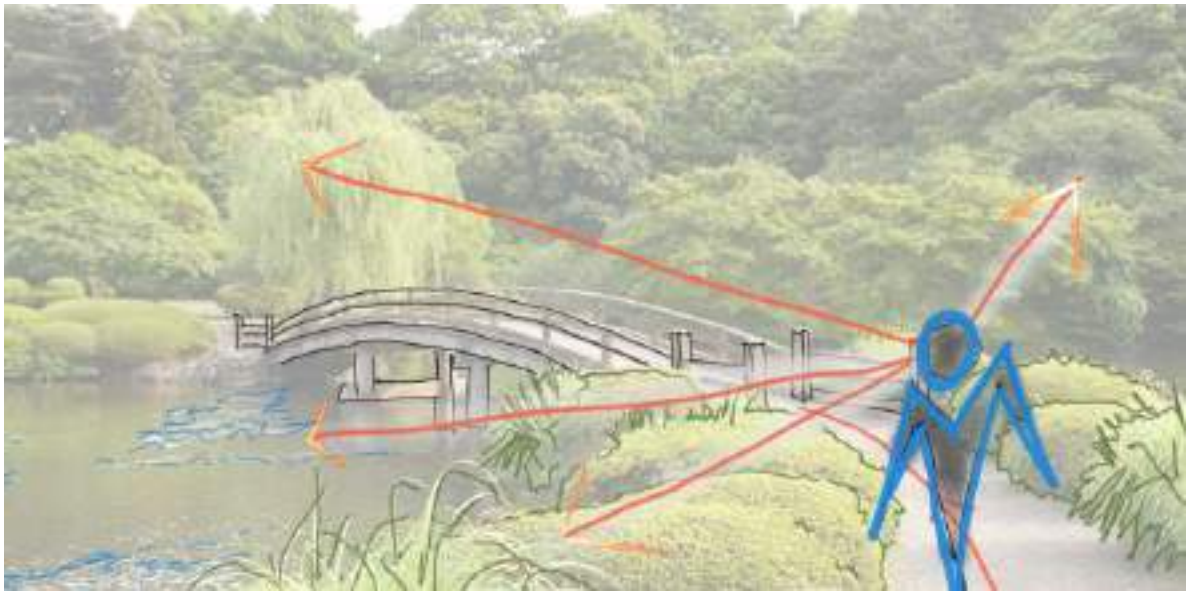


Figure 26: *Japanese garden demonstrating the kinaesthetic experience. The visual sense stimulated through movement*

Source: *(http://www.japanesegardens.com, edit by author)*

A historic example of the kinaesthetic experience can be found in Japanese gardens, when crossing step stones for example, the user is forced to stop at each stone and look down before taking another step, this involves eye movement and even brings neck muscles into play. This is an example of how movement, perception and the senses work together.



Figure 27: *Synaesthetic filter by Stefan Rutzinger and Kristina Schinegger, the pavilion is designed to filter space visually and acoustically while maintaining a playful integration with its surroundings*

Source: *(https://www.dezeen.com)*

Synaesthesia refers to the overlapping of senses. When referring to sense as ‘modalities’, it demonstrates their separation. Synaesthesia refers to the connection of the sense based on the information received. For example, looking at the colour red, people often perceive red to be associated with something that is hot thereby causing a link between the touch and sight.

With that being said, it is clear that the perception of space is more enhanced by the stimulation of multiple senses simultaneously. When it comes to architecture, experience and perception there are a number of authors and architects that have various approaches to this. The following looks at a few authors and architects that have major influence on an architecture of senses.

Each individual views a space differently, this is known as their perspective. Their perception is shaped by a number of factors such as their perspective combined with experiences and personal biases.

The following authors understanding of phenomenological architecture will be critically analyzed to formulate the optimal solution and approach to design that ensures the outcome is beneficial to the healing and learning of individuals with physical impairments.

(Pallasmaa as cited by Vermeersch,2013) uses phenomenology to begin his study of ‘perception in architecture’. Pallasmaa’s idea is that the human body is in the middle of the experiential world and that our senses interact through our body. He believes that body and world define each other.

“The perception of the body and the image of the world turn into one single continuous existential experience; there is no body separate from its domicile in space, and there is no space unrelated to the unconscious image of the perceiving self.” (Pallasmaa,1996)

Pallasmaa believes that architecture is experienced using all senses, not just vision alone. Individuals experience space, not just with the five senses but it involves different realms of sensory experience, inclusive of muscles and skeleton. All of these senses combine and interact with each other and play a role in how we experience space. He also states that memory plays a role in adding to our sensory perception. This is important to note because a space of healing should be easily interchangeable in the case that the space can trigger a bad memory and put a particular individual in a traumatic situation.

Touch is one of the most important sense because all other sense can be connected using touch. Touch brings a user more intimately close to a building, allowing the user to connect and feel what was viewed at a distance or in isolation.



Figure 28: *A public space with seating. The atmosphere is enhanced by nature, light, and the surrounding buildings*

Source: *(https://medium.com)*



Figure 29: *A public space with seating. The atmosphere is enhanced by the vibrance of the night, the people and the common activity which is the movie.*

Source: *(https://medium.com)*

(Zumthor as cited by Vermeersch,2013) looks at creating an atmosphere. It is common for humans to understand and feel the atmosphere of a room or place from the first impression. The moment one enters a room, one has an associated feeling. Peter zumthor has a more bodily and emotional way of approaching perception. Zumthor looks at atmosphere, the impressions of light, types of sound as well as tactile elements.

The atmosphere of a place is the combination of the objects within the space as well as the place itself and the sensory qualities emitted from that place. Similar to how Pallasmas regards that body and world define each other, Zumthor correlates that the atmosphere comprises of both the 'beholder' and the place itself. Zumthor explains this using an arcaded square, the atmosphere is made up of the objects such as lighting, chairs and sounds. Removing the square, removes the atmosphere. However, the atmosphere of the place is also dependent on the user's mood, feelings and expectations.



Figure 30: *In the 21st century the atmosphere of spaces can be enhanced with technology like public lighting and new interactive furniture for streets and public spaces*

Source: *(https://www.hraadvisors.com)*

These three authors have slightly varied views about perception. It is established that sensory architecture plays a vital role in the healing and education of individuals with disabilities and that spaces that stimulate senses are beneficial. In order to create the most inclusive multi-sensory spaces, a combination of these three authors views is needed. The way people perceive spaces is not just what the professional is trying to achieve, it is also situation and context dependent. It should allow for a diverse group of people to experience the spaces in ways that are most comfortable to them. A space should not only be a visually appealing, it should

stimulate senses in a way that bring the user closer to the building and help them become a part of their environment to assist them on their journey to development and healing. Lastly, the environment should be a positive environment. Careful consideration should be placed on the objects of that environment as well to create an atmosphere that is comforting and welcoming from the very first impression.

4.3 Holistically fusing sensory stimulation for an enhanced experience of spaces

Perception or sensory experience isn't a singular function of our body for example 'looking and listening' is to be taken as a s singular activity rather than two separate activities. Juhanni Pallasmaa is a believer of this as well. One of the aspects of multisensory perception is the blurring of the boundaries between senses for our interaction in the environment we are in.(Ingold as cited by Vermeersch,2013)

If we have to take this as being true, then it becomes possible to further integrate an individual in an environment using multisensory design. Should an individual be deprived of one of their senses, the over stimulation of the other sense can help them better perceive their surrounding and help them in their learning and healing.

Responsive architecture is essentially interactive architecture; it involves interaction with individuals. It integrates them with their environment and has influence on how they think, feel and behave. Sensory design is an approach to designing in a way that puts the occupant at the center while considering the affects in may have on them. The possibility for a better lifestyle is possible by understanding the way people experience spaces. Sensory design is needed in responsive architecture because attention to how an environment will impact an individual is important.

When design is executed with the occupants taken into consideration, it is important to try to create an experience that isn't only 'in the moment' but also have a lasting effect that stays with them 'after the moment'. This aids in assisting the user to function and feel better. An architecture that does not include the stimulation of sense is not one that engages its occupants or helps them.

In looking to design for the user to stimulate sense to aid healing and education it needs to be noted that the environment needs to cater for a diverse group of people. Not just a group of people with a specific type of impairment. So, in considering a sensory approach it would best

to consider an environment that is able to stimulate multiple senses. This is called a multi-sensory environment.

Multi-sensory environments aid in developing an individual's social skills, intelligence and thought process. This provides individuals with impairments the chance to enjoy a variety of experiences that are stimulated by their senses. Individuals with impairments often experience their surrounding environments very differently than others. This is due to their inability to move freely or because of visual or behavioral difficulties which create obstacles in their environments. By creating a multi-sensory environment, it can help to ease the restrictions posed by these barriers. A multi-sensory environment creates a calming effect and allows for the activation of different perceptions. According to Alex Hooson, when time is spent in a multi-sensory environment it can have a positive effect on creativity, socializing, communication and concentration. (Hoosen,2018)



Figure 31: *An example of a sensory room used in the therapy for individuals with sensory impairments and autism*

Source: *(https://www.spacekraft.co.uk/)*

"Multi-sensory environments have not only provided alternative and powerful forms of sensory stimulation for individuals; they also had a huge impact within health and education sectors. Providing new ways of encouraging learning, development, cognitive development, language and social interaction skills." (Hooson, 2018)

Multi-sensory environments can bring about change in an individual's life. It allows for:

- Increased attention and concentration.
- The reactivation of senses.
- Better coordination
- The user to explore their environment
- The user to be able to enjoy themselves
- Creativity.
- Social interactions
- Reduction in stress (mental and physical relaxation)
- A reduction in aggressive behavior.
- Better communication
- A getaway from painful treatments.

"It is important to understand how we use all of the senses to perceive a space, whether we are conscious or aware of all of their influences and impacts on our experiences." (Holz, 2011)

When one moves, their body interacts with the environment. This is a description of Juhani Pallasmaa's theory that body and environment define each other. Sensory systems don't just passively receive information. They are mechanisms that are aggressively and actively seeking information. This information is processed by the brain, then linked to memories and thoughts. These memories and thoughts create a mood and feeling for a particular space. This connection that lies between spaces and experience is something that is very important when designing a building.

The built environment influences all of the senses even if one isn't functional, the built environment has an effect on the senses that are functioning.

According to Pallasmaa "The human eye is the most perfectly tuned for twilight rather than bright daylight." This indicates that spaces are more enjoyable when the lighting is more subtle and has a variety of intensities. Low lighting can give a space more depth and create a brighter focal point on which the eye will usually notice first.



Figure 32*: A space with low light is more comfortable to be in and can create a focal point to draw the attention of the user's eye with greater ease*

Source: *(https://cgi.tutsplus.com)*

"Buildings create sounds and reflect sounds that bounce of the building back to the ear." (Holz, 2011). This works in conjunction with the other senses to trigger memories and govern the feeling of that particular space. The way that architecture can assist in ensuring that the connection is felt in that space is to block off external sounds and allow the user to feel what they are feeling, uninterrupted by external noises. Depending on the materials used in a space, the sound can be inviting or rejecting or it can even create an intimate connection with the building and the user.

Smell is the sense most linked to memory. According to Pallasmaa A particular smell makes us unknowingly re-enter a space completely forgotten by the retinal memory; the nostril awakens a forgotten image, and we are enticed to enter a vivid daydream. In a building, a smell can instantly trigger a feeling or memory and as a user your perception of that space can change making you become more integrated with the building.

Touch is important in order to fully engage and experience a space. This is usually sensed by the feet. Walking allows experience of different textures and densities of these textures. Touch isn't always direct; skin is affected by the temperature of an environment. Just like other senses, touch allows us to connect with a spaces in a more direct and intimate way.

Taste is the most intimate sense and has a link with all other sense but is closely related to smell. “Experiencing architecture can bring the world into intimate contact with the body.”



Figure 33*: Plinthos. A multisensory interactive pavilion that produces different levels of interconnected media to engage the user from multiple directions and allows them to be the performer and the user simultaneously*

Source: *(* https://www.archdaily.com)

4.4 How multisensory architecture empowers healing and learning

According to (Hesselgren as cited by Berg, 2014) when an individual loses a sense, the other senses are heightened to aid in understanding their surroundings better. When the other sense is heightened, using a multisensory approach to architecture may prove to be more effective in helping an individual with impairments to engage and understand their surroundings. The overlapping sensory experience can make it easier for them to find a more calming and relaxed state for their fitness and learning. A better experience than stimulating each individual sense in an environment.

Rehabilitation of individuals with physical impairment should be explored so that the current advancement in technology are inclusive and don't exclude individuals with impairments. There are two approaches to rehabilitation, the rehabilitative approach and the humanistic approach.

Despite having an impairment, individuals need to build confidence and a sense of independence, especially those who are in the process of transitioning into adulthood. Individuals with impairment often become excluded from society.

Architecture is very important in how humans relate to their senses; these senses can help individuals with physical impairment to gain the necessary skills they need for adulthood. Architecture should not only assist those individuals with impairments, but also aim to provide a platform for everyone so that these individuals become reintegrated into the norms of how things happen.

This can make certain individuals with physical impairments feel isolated, especially those that are visually impaired. If the design takes into consideration the other senses, then a blind user may still be afforded the opportunity to experience the environment regardless of their impairment. The user would then be able to perceive and connect with their own emotions just like everybody else. In order for a user to perceive, more than one sense need to be stimulated and due to this it is very important that design doesn't just look at senses individually but rather have a 'multisensory' approach. This makes sure that all the other sense of the impaired user is still fully engaged.

Materials are the basis of how perceptions are perceived. In modern architecture there are a lot of glass, steel and moulded plastics that are used to make a building look pleasing to the eye. But materials affect the acoustic sound value of a space, the way the building feels to the touch and the light and aroma of a space. This creates as certain atmosphere to the building that can put an individual with impairment in a calmer state and more at ease as well as give them a more secure feeling in an environment.

The impact of one's sense experienced on a daily basis is often overlooked. An individual's perception of the world relies on their senses. Without our senses our lives as human beings wouldn't be the same. There would be no recognition of odour, colour or taste. Basically, the world we live in is made up of what our senses tell us. The aim of sensory design is to have an influence or an impact on the user's behaviour and well-being. It looks at how sensory stimulation can improve the quality of the lives of occupants.

The word ‘Healing’ originates from the Anglo-Saxon word ‘hælan’ which translates to ‘make whole’. This mean that healing is more than a physical process but also a process of an individual becoming ‘whole’. This also implies that healing is very much different from curing. What this means is that an individual can be healed but not necessarily cured. Their illness may not be cured but they can learn to accept it and live the rest of their lives with it with a positive mind-set. spaces of healing can be broken down into the natural environment, the built environment, and the social environment.

The natural environment (nature) is often the most common environment people think of when healing spaces are mentioned. It is believed that the natural environment can bring physical, emotional, and spiritual healing to an individual. When an individual spends time in a setting of nature, whether it is controlled gardens or a purely natural reserve, an individual becomes isolated from the stresses that is caused by the environment that they are familiar with. The reason that humans find nature so calming and stress free is because humans are rooted in nature.



Figure 34: *Nature helps speed up the healing process by putting the patient in a comfortable environment*

Source: *(* https://janneallaw.com)

The built environment is one that is constructed by man. This also has the potential to help an individual heal but unlike nature which is natural, in the built environment it is a curated process. The concept of healing in the built environment is often dependent on the architecture and how it evokes memories and emotions by sensual stimulation. Another important concept in the healing process that is linked to the built environment is symbolism. Many of the objects in the environment have some symbolic attachment to our lives. When an individual engages with the symbolic aspects of an environment it triggers thoughts and a variation of behaviours.



Figure 35*: If the built environment is design by taking healing into consideration rather than efficiency then the built environment can aid in the healing process of an individual*

Source: *(* https://experiencelife.com)

The social environment is integral to an individual's healing. It involves everyone that has a connection with the individual undergoing the healing process, this includes nurses, caregivers, family and friends. The healing itself is considered to be a social activity that brings together the different people who play different roles in that individual's life. This idea came about after World War two. The removal of the division between patient and staff created an environment that was more healing.



Figure 36: *The social realm is a very important aspect in the healing and of an individual. The removal of the division between patient and staff should push beyond institutes of healing and into the reality of the world. This image shows disabled people being a part of a normal community and going about daily life just like everyone else*

Source: *(* https://lucielink.stlucie.k12.fl.us/disability-awareness/)

The combination of these three environments has the potential to create very powerful and meaningful spaces of healing for individuals with physical impairments. They can create bonds, evoke emotions, enhance perception and aid in creating conducive environments for healing as well as learning.

Studies done by professor of architecture (Ulrich as cited by Osei,2014) looked at patients who had a view of nature as opposed to patients who had a view of a brick wall and the summary of this was those patients who had a view of nature required less pain medication and recovered a lot faster. In addition to this, materiality had also made a big difference, by simply using a wooden finish to a room helped in lowering stress levels. Essentially the main aim of multisensory design is to help an individual in healing, dealing with and reducing stress.

Spaces of healing require spaces that incorporate nature, light, good quality air and a positive atmosphere that eliminate stressors and noise. A lot of hospitals are designed as 'warehouses' for the sick and designed more to accommodate technology rather than being designed for a patients healing. The spaces in which individuals stay for weeks and months is also not taken into consideration. This influences the healing of patients. As much as any patient needs to be treated for any illness they may have, they also need to be in an environment that is comfortable and not intimidating. In the 1970's, most hospitals only had air-conditioning in rooms that had heavy equipment such as x-ray machines. (Jencks as cited by and Osei,2014) didn't approve with how hospitals were designed, they were designed as a maze of corridors and were dedicated to efficiency. In spaces of healing or treatment patients need to feel comfortable and not intimidated and confined.



Figure 37*: A hospital corridor that's very static and depressing that can be seen as demotivational by the patient.*

Source: *(* https://za.pinterest.com)

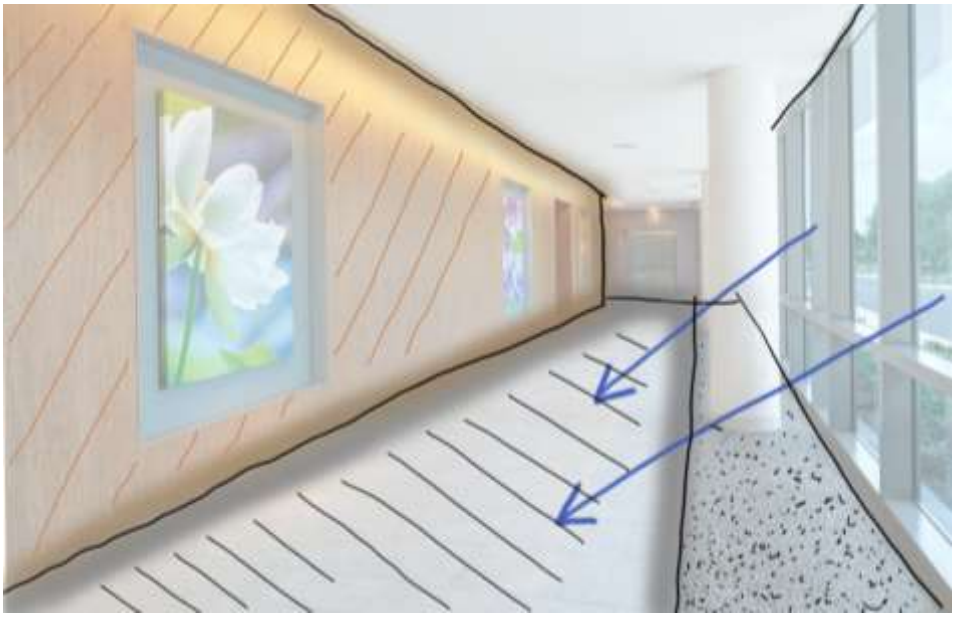


Figure 38*: A hospital corridor that's utilizes different materials and takes into consideration multisensory design is seen as more vibrant and uplifting*

Source: *(* https://www.allthingsflooring.com,edit by author)

The wife of Charles Jencks was diagnosed with cancer and had to attend chemotherapy noted that the waiting for the therapy isn't bad but rather the spaces to wait in that drains an individual of hope. She was trained in architecture and landscape and this experience drove her to form her own chain of cancer care centres called 'Maggie's cancer caring centre' which didn't only aim to help individuals in their therapy but also to uplift and heal spirits. Many of the care centres she had were designed by famous architects such as frank Gehry, Zaha Hadid and Richard Rogers. Her care centres incorporated experiential architecture enhanced by good quality light, space and openness along with good views and nature as opposed to a building that feels institutionalized and makes an individual feel confined.

4.5 Conclusion

Understanding the connection and interaction of the bodies and environment will assist in designing for influential space. The spaces should be comfortable and stimulate all senses to put the user in a comfortable space to make the learning of skills easier as well as creating a more nurturing environment for healing. Utilization of multisensory design to trigger memories and create feelings is also important in creating a more comfortable and user-friendly environment.

This allows for the space to be more welcoming and help the user to have a more memorable interaction with the environment. It is important to keep in mind that every user experience and memories will be different when designing and that all memories and experiences differ based on that individual's memory.

Multisensory design makes it possible to achieve a more holistic experience as well as allow for the user to connect with the building despite their impairments. The experience and memory are needed in order for the user to feel what the building wants them to feel.

"Experiencing architecture can bring the world into intimate contact with the body." (Holz, 2011)

CHAPTER 5.

KEY PRECEDENT STUDIES

CHAPTER 5 KEY PRECEDENT STUDIES

5.1 INTRODUCTION

This chapter justifies the theory of universal design, empowerment, and phenomenology against the selected buildings

5.2 PALO ALTO POLYTRAUMA AND BLIND REHAB CENTER



Figure 39: *Palo Alto polytrauma and blind rehab centre entrance*

Source: *(https://www.architectmagazine.com)*

Location: 3801 Miranda Ave, Palo Alto, CA 94304, Building 7D



Figure 40: *Location of the Palo Alto polytrauma and blind rehab centre*

Source: *(www.googlemaps.com)*

Architect: The design partnership and Smiths group

Project year: 2020

5.2.1 Project description

The Polytrauma and blind rehab center in Palo Alto, California is a facility that caters for individuals that suffer from visual impairments as well as individuals that have a number of injuries. It was specially made by the United States department of veteran's affairs or VA. The renovation of the existing blind rehab center was done in a partnership between two architectural firms, the design partnership and Smiths group. Both firms are based in San Francisco. It was initially the design partnerships project because the VA had initially wanted just a blind rehab center. When the VA had decided to include a polytrauma rehab center with the blind rehab center, then the design partnership had teamed up with Smiths group and restarted the designing process. During the designing of the project, Christopher Downey had joined Smiths group to assist, because he had lost his sight and was also going through a rehab program. Smith's group was interested in his personal experiences and this was a benefit to the project. The entire facility caters for a wide range of disabilities. Individuals with disabilities are not only treated but also trained for living a life with these disabilities. Some of the staff at this facility also live with visual impairments.

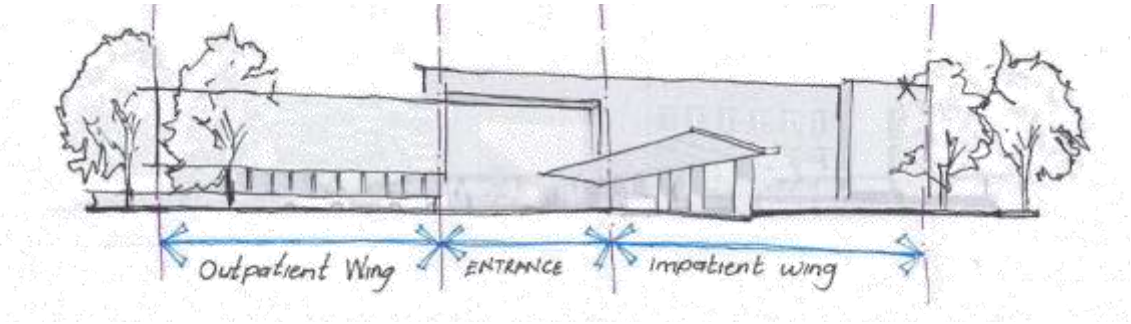


Figure 41: *Palo Alto polytrauma and blind rehab centre entrance relationship between the two wings and the entrance*

Source: *(https://www.slideshare.net , edit by author)*

5.2.2 Justification of precedent study

The facility caters for individuals with multiple and various disabilities and has a unique approach to the treatment of the physically impaired. The facility helps individuals recover as well as trains them for a future of independence.

5.2.3 Urban setting

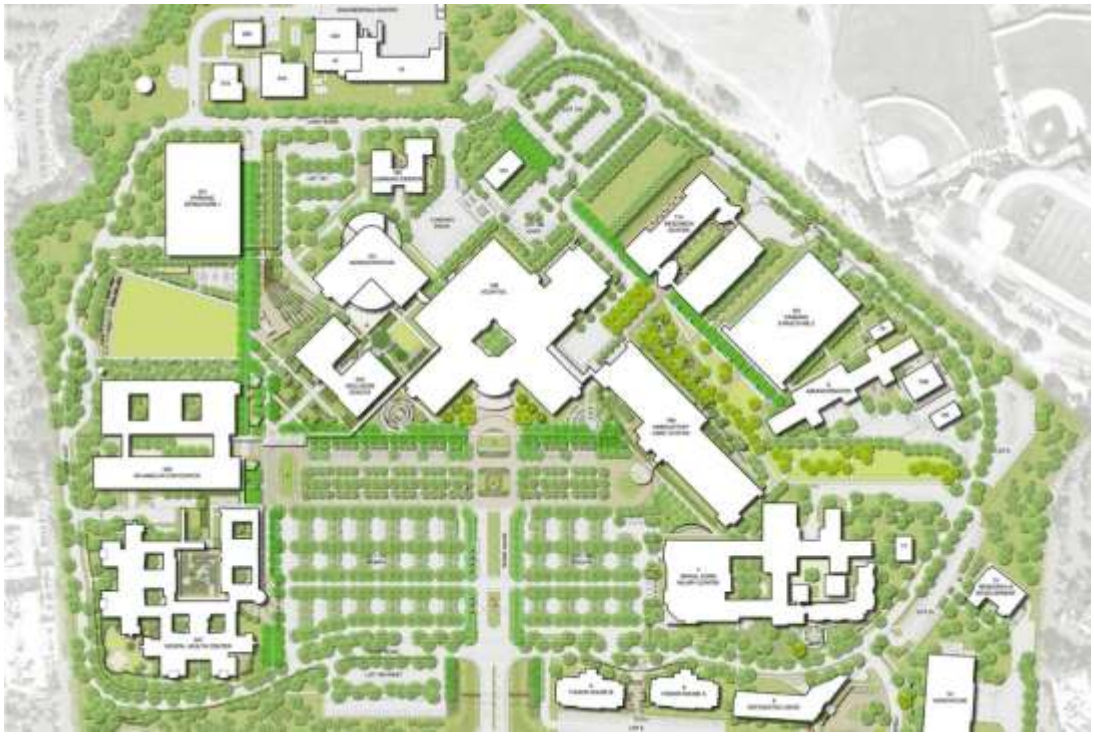


Figure 42: *Palo Alto polytrauma and blind rehab centre relationship with the rest of the facility*

Source: *(http://www.rhaa.com)*

The VA Palo Alto polytrauma and blind rehabilitation center is set in a medical campus surrounded by facilities such as clinics, lodges, research facilities, hospitals, mental health centers, aquatic therapy center etc. The facility is located such that it is easily accessible to the public and can be reached by car and public transportation such as bus. The Bus drops of close to the main campus building. The campus is central to a variety of areas. Residential areas are located on the east of the campus and the entire west side of the campus has a mixture of commercial. Educational facilities such as universities are spread out from the north, west and south of the Palo alto campus. Religious and entertainment facilities are also in close proximity to the facility.

The location of a site for a facility for individuals with impairments is critical because this can assist in their transition into adulthood during their healing and training.

5.2.4 Legibility and wayfinding

There was an existing facility that was a rehab center for the visually impaired that needed to be renovated and extended with the inclusion of a polytrauma rehab center. The center featured three programs:

1. Intensive inpatient: This was a 24-hour services for people living at the facility.
2. Transitional services: Help is provided as needed
3. Outpatient services: People leave in the evening.

As the intensive impatient course, individuals who have recently lost their sight are taught how to move about their environment and perform daily tasks and general living skills. These all take place in specialized training rooms. The building itself plays an important role in the process of rehabilitation. The entire building is considered to be an educational environment. The required main concepts for spaces were that the building and the spaces are created realistically just as they would be found in most public buildings. This is so that the individual with impairments learns to navigate in spaces that are not always user friendly so that they are able to cope when they utilize buildings that are not designed for the impaired. This however is a gradual increase in intensity. The ward is where it all starts, so the ward features a basic simple layout with strategic placement of landmarks as well as a minimum number of hints. The landmark that is placed needs to be one that has visual, auditorial or tactile characteristics.

The new rehab center is a part of the VA health care campus in Palo Alto in California. The existing building was an ‘F’ form. This allowed for an easy numbering system and the inpatient and the outpatient were each on different floors. This made it easy for individuals who were new to blindness. It allows for easy orientation and reduces the chances of getting lost. By using the existing building, the staff were able to easily identify what worked in the building and what needed to be addressed for the users who have impairments.

5.2.5 Enhancing the experience of the building

The primary concept of the new building is to intentionally create environments for newly blind individuals that are not easy to navigate. The building as a whole forms part of a mobility and training program. So, by doing this, the individual learns to deal with the real world and normal environments and will be able to navigate through any environments more easily and with more confidence. The new building is challenging to navigate but it features landmarks so that the individuals don't get lost and are provided with spaces for resting. This allows the user to learn different routes to navigate the building as well as allowing them to learn these different routes at their own pace. The facility features semi-public hallways that that have a 'neighborhood' feel and it is essential that the building provides a home like environment for the individuals that stay there for long periods of time. Materials, colors and furniture play a big role in creating this home like environment.

The separations in structure are between the inpatient and the outpatient services as well as one between the blind rehab center and the polytrauma rehab center. This is on one of each of the two parallel wings Inpatient and outpatient on each wing: two floors for the outpatient wing, (polytrauma on the ground and blind rehab on the first) then three floors for the inpatient wing on the inpatient wing polytrauma on the ground and blind rehab on the upper two floors. Both wings are connected by two bridges. These bridges provide a non-visually perceivably transition.

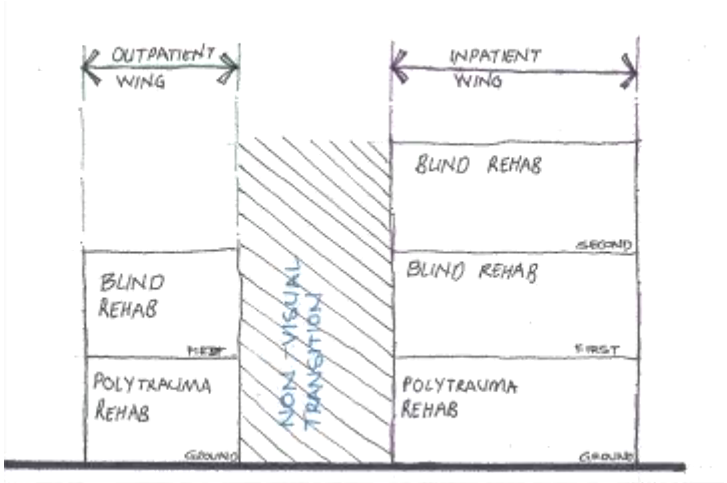


Figure 43: *Section demonstrating solid and void between the two building wings*

Source: (*Author)*

On both wings of the building the corridors form a loop and are double loaded with rooms on either side. The outpatient wing consists offices, treatment rooms and training facilities and the inpatient wing consists of patient rooms as well. On both the blind rehab center and the polytrauma level the corridors are orthogonal so the flow is simple and easy to understand. Unlike the inpatient wing on the polytrauma unit, the outpatient wing has corridors that branch of into different directions rather than forming simple loops.

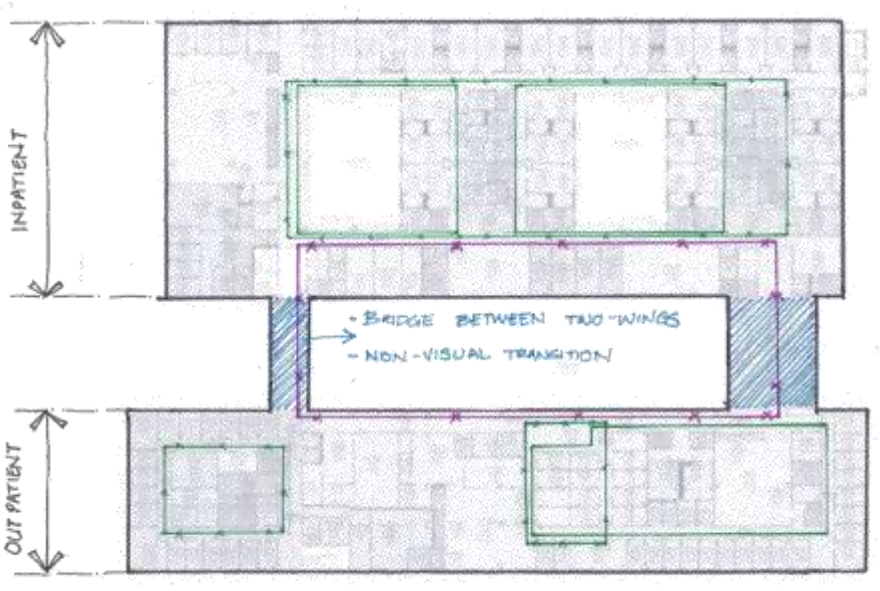


Figure 44: *Ground floor plan circulation designed to be easy to navigate through*

Source: *(https://www.slideshare.net, edit by author)*

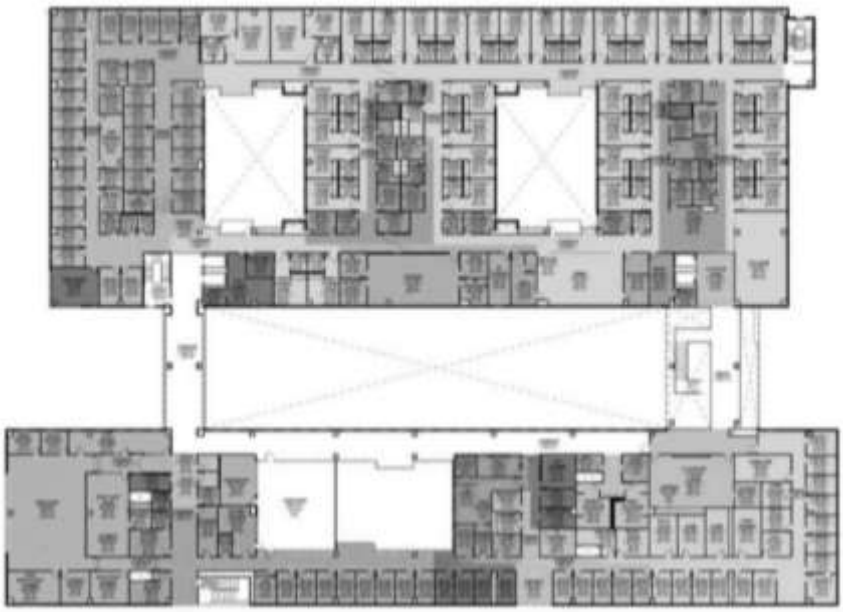


Figure 45: *First floor plan circulation doesn't form simple loops to allow for the user to learn to adapt to an environment that isn't conventional*

Source : (https://www.slideshare.net)

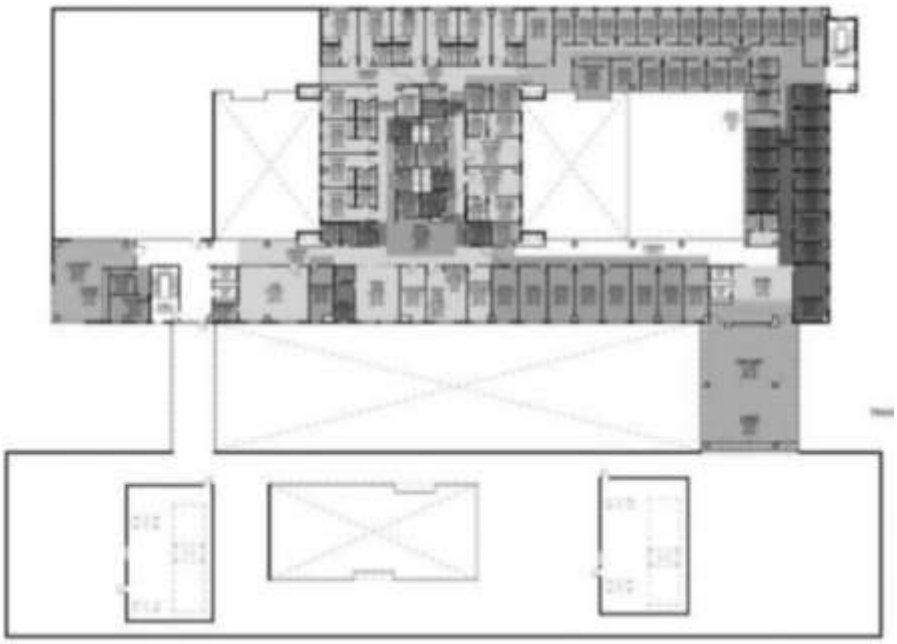


Figure 46:*Second floor plan circulation doesn't form simple loops to allow for the user to learn to adapt to an environment that isn't conventional*

Source: *(https://www.slideshare.net)*

Unlike the existing building the new building now utilizes far more subtle colors to make the users feel more at home. This also promotes a calmer environment. The inpatient wing has two patios, one large patio that is between the two wings as well as one patio on the roof garden in the outpatient wing. This allows light to penetrate deep into the building. This also has an effect on the visually impaired individuals. When the light reaches the corridors, they allow for a temperature change in the corridors which are recognized by the visually impaired individuals on their walks. The outdoor spaces have many functions such as a general courtyard for leisure, sports fields, greenhouses, a therapeutic labyrinth, a multisensory garden and a material garden. On the roof, A fountain is placed strategically so that the acoustics serve as an attractor to invite the user to explore further. Once the user is in the garden, the fountain serves as a barrier to provide resting spaces of privacy for conversation.

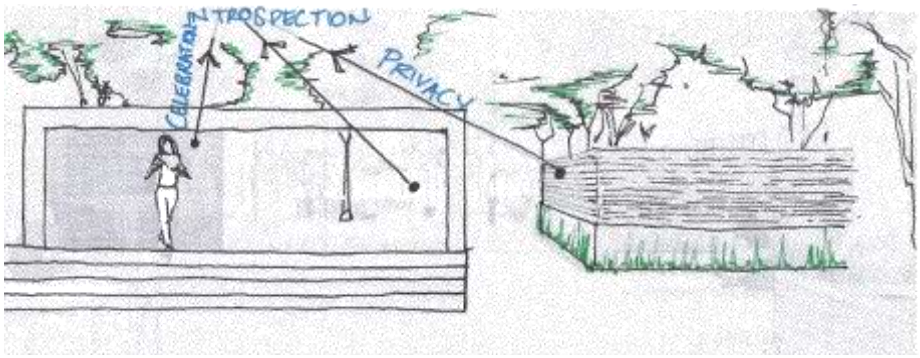


Figure 47: *The garden is placed strategically, to invite the user to explore further. The garden allows for a number of activities.*

Source: *(https://www.slideshare.net, edit by author)*

On the corridors as well, there are places for seating at regular intervals. These spaces of resting form acoustical tactual landmarks due to the variation of materials, on the corridors there are porcelain tiles and in the resting areas there are carpets. The benches and the sofas are placed strategically so that they do not disrupt the flow of the circulation.

The entrance lobby is the most confusing space in the building. Both wings of the building connect at the entrance and the entrance also has the reception desk, waiting area, and a bridge that runs the double volume space.

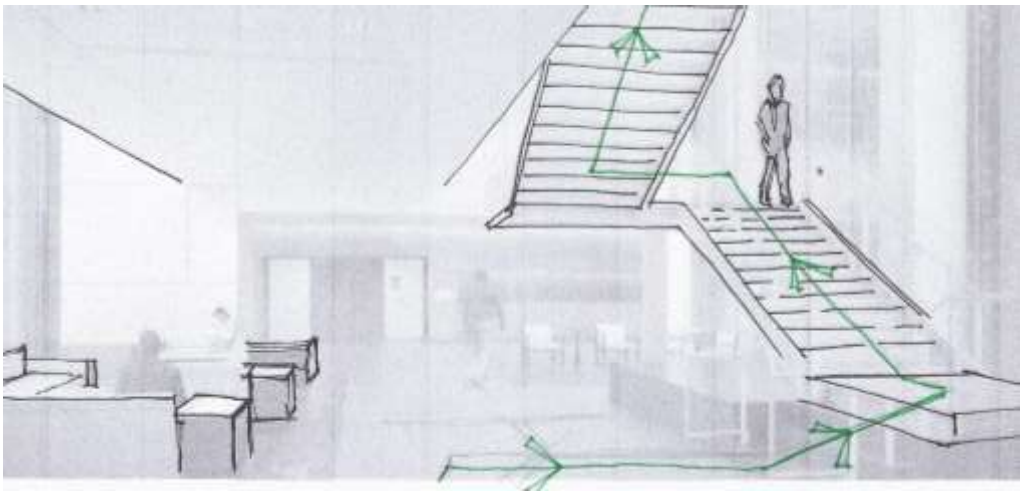


Figure 48: *Circulation space is directly opposite the reception to allow the user to easily transition between spaces*

Source: *(https://www.slideshare.net, edit by author)*

The entire building has sufficient multisensory elements that help the visually impaired students find their way. The ceiling under the bridge is uniquely designed so that the sound reverberates the ticking of a cane so that an individual can easily distinguish between the bridge and any other space. The base of the stairway is placed in line with the reception desk so this makes it possible for the receptionist to easily describe to an individual on how to reach the first step. The waiting area is also differentiated by lighting or the warmth of the sun for individuals with visual impairments.



Figure 49: *Custom designed acoustic ceiling that notifies the user of where they are through the change in sound reverberation*

Source*: (https://www.slideshare.net)*

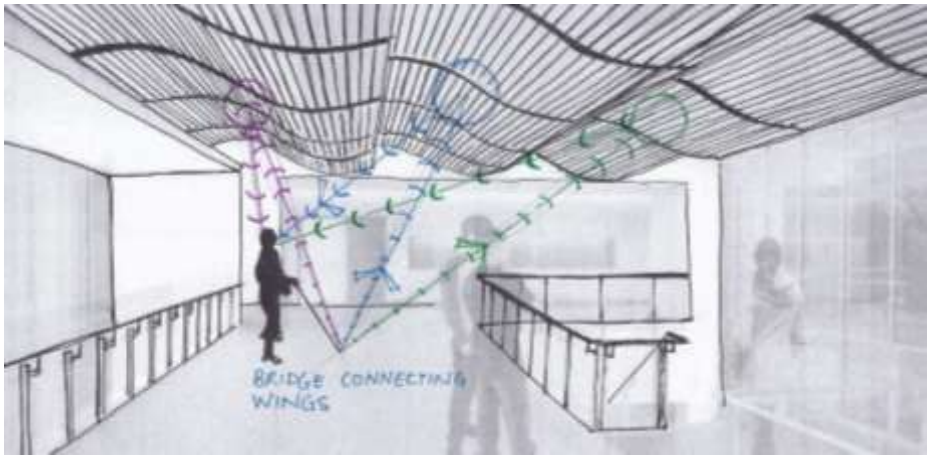


Figure 50: *Custom designed acoustic ceiling that notifies the user of where they are through the change in sound reverberation*

Source: *(https://www.slideshare.net, edit by author)*

5.2.6 Innovation through empowerment

The presentation of the project to the client was a normal presentation such as plans sections and 3Ds before Chris Downey joined. When Chris had joined the team, the presentation was more haptic and this was a positive thing because this allowed for the visually impaired staff to be involved.

Chris Downey is not able to understand the general media that architects and the Smith's groups use and so he came up with his own method of designing which was mostly based on the haptic sense. When he first joined the team, he needed to first understand what the team had done thus far on the project, so he got all the drawing that he could and had them embossed. Embossed drawing are drawings that have a relief on them so the user is capable of feeling the drawings with their hand. So, he used this method to understand where the firm was with the project thus far. On the project, Chris Downey used wax sticks to make line drawings that had haptic qualities. The wax sticks are able to be manipulated and bent for designing purposes and can also stick to each other to form more intricate and complex shapes. They can be read by simply feeling them. By using these wax sticks he is able to design and draw by himself.

These usually start of in two dimensions and then are further developed into a three-dimensional frame. Chris Downey uses these wax stick design together with the embossed plans.
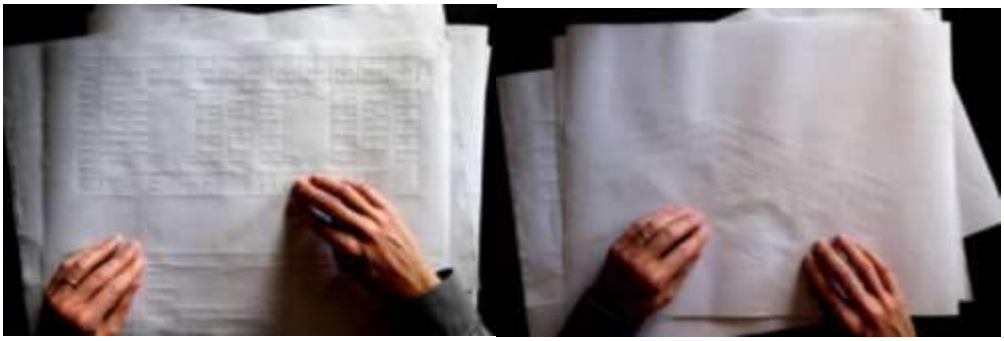


Figure 51: *Chris Downey reading plans that he had embossed*

Source: *(https://www.slideshare.net)*

Chris Downey also used his body to understand and test the materials of a spaces. He applies his experience to help him in designing these spaces. Whenever he comes across any interesting sensory experiences, he further investigates the materials and the spaces and then uses it in his future designs. In his firm his actions are very different and also very important because his experience is very close to how the individuals with impairments at the rehab center.

The blind rehab and polytrauma center are a good example of how individuals with impairments and spaces can be used to empower people and make a difference in the lives of everyone. The architect of the building was a newly blind individual and he knew the difficulties that individuals with impairments face which made the process of design more intimate. Not only was the building designed from a unique perspective but the architect also included the input of the staff of the building, some of which were blind as well so that they could better care for the individuals that utilize their facility. This building is a perfect example of how the built environment and the social realm can be empowering to every individual, impaired or not. The center not only helps the individual in their rehabilitation but also helps them with daily skills that they will need once they have healed so they can be less dependent on others or completely independent. If the built environment along with the social environment can assist in helping impaired individuals to this extent, then it shows that spaces of empowerment can assist individuals with physical impairment learn new skills that are required for self-sustenance in the 21st century

5.2.7 Conclusion

The center features a unique approach to healing in using the built environment. The design using a multisensory approach resulted in a more immersive healing space for these individuals, visitors as well as staff. The center reduces the barriers that patients face and allows for successful rehabilitation. This allows not only for a good recovery but also for a good future for the patient. In understanding this particular building, it can be concluded that along with multisensory design it is important for the circulation to be well designed and to allow for multiple spaces of different activities. Based on the success of this building in helping individuals with impairments long-term, it proves that the built environment can provide a good platform for helping individuals with physical impairment in transitioning into adulthood by equipping them through training and skills development in the 21st century.

5.3 SPAULDING REHABILITATION HOSPITAL



Figure 52: *View of the Spaulding rehabilitation hospital from the outside*

Source: *(https://www.archdaily.com)*

Location: 300 1st Ave, Charlestown, MA 02129, United States

Architect: Perkins and Will

Project year: 2013

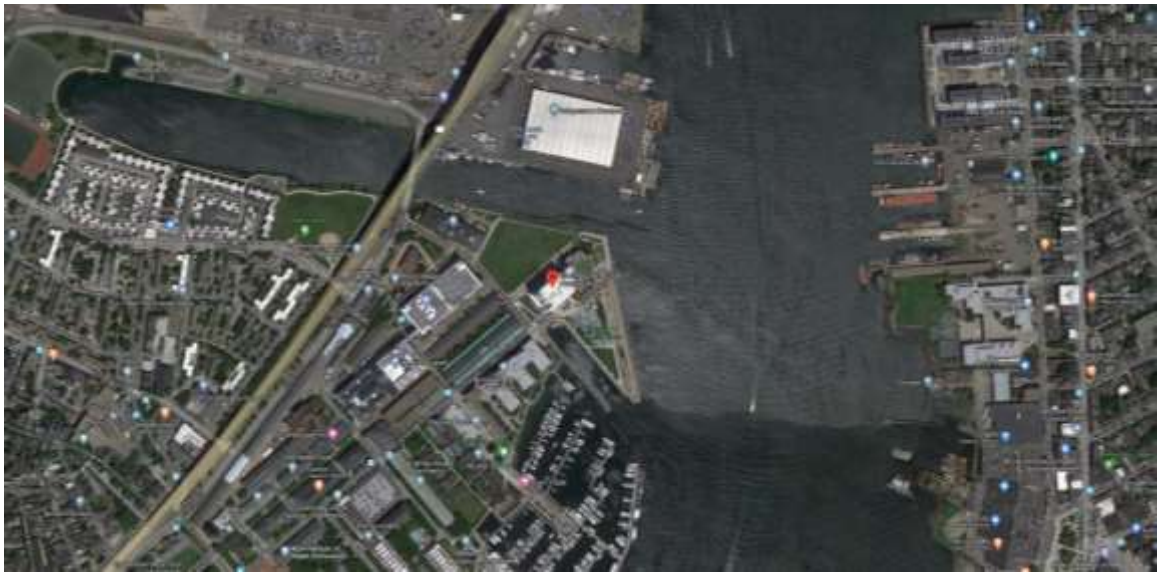


Figure 53: *Location of Spaulding rehabilitation hospital in its context.*

Source: *(www.googlemaps.com)*

5.3.1 Project description

Located in Charlestown, Boston the Spaulding rehabilitation center was opened in April 2013. The hospital did not have time to settle in and was immediately challenged because it had opened around the time that the Boston marathon bombing had occurred. Some of the very first patients were individuals that had survived the bombing. The Spaulding rehabilitation hospital is said to be state-of-the-art and is built with all the necessary facilities to assist individuals in treatment and allowing for them to gain independence before they leave.

5.3.2 Justification of precedent

The site was initially contaminated with oils and greases, but this was looked at in a symbolic way. If a toxic place can become a space of healing, then a broken individual can return to health

The Spaulding rehabilitation hospital is one of the biggest rehabilitation hospitals in the United States and has won awards for best in the acute care in the 2013 healthcare environment. In terms of size the hospital is 237,600 square meters and features two structures, a tower that is eight stories high for the inpatients and then the lower 3 stories are more publicly available. The three floors at the bottom feature a therapeutic pool. The Spaulding rehabilitation hospital was a replacement for an existing hospital that was not too far away from the new building's current location. The concept of the initial hospital was to be like a nursing home but that facility was inadequate and never achieved that. The new mission of the new hospital is to

improve the lives of patients while they are at the hospital and also when they leave. Spaulding Rehabilitation hospital promotes sustainability, inclusiveness and patient care.

5.3.3 Urban setting

The Spaulding rehabilitation hospital was initially located on Nashua Street in Boston, but it had small rooms, inaccessible bathrooms, and a narrow corridor. These were not ideal for a rehabilitation hospital. After much consideration with a specific criterion for a revamp in mind, the decision was to keep the facility at the waterfront. Two properties in Charlestown navy yard were purchased in 1979 by the Boston redevelopment authority for renewal. This plot showed potential for their programme. The goal was for the building to become a part of the urban fabric. It was also proved in a study that spaces with good views allow for a faster recovery in patients. So, the aim of the Spaulding centre was to maximize the beautiful views of the harbour.

The facility is located along the Boston harbour walk and 75 percent of the ground floor is open to the public. The water front spaces are now more public to bring in members of the community to allow for the engagement of the public with the patients. This is a new take on addressing the water front.

5.3.4 Legibility and wayfinding

The seven principles of universal design were taken into consideration for the design of the Spaulding rehabilitation center. Each of the seven principles was used in the design process and helped in the developing of solutions to problems that the old building had faced.

The building relates to its context using a waterfront walk. The Spaulding rehabilitation is highly accessible to the public. Boston had required that 50 percent of the outdoor spaces and 75 percent of the ground floor spaces be accessible to the public at all times. The architects had strategically designed the hospital so that the interior spaces spill out to the exterior spaces. The Spaulding rehabilitation hospital is a building that is easy to utilize and is comfortable to all its users.



Figure 54: *Vast open spaces and high volumes create a calmer environment for healing*

Source: *(https://perkinswill.com)*

5.3.5 Enhancing the experience of the building

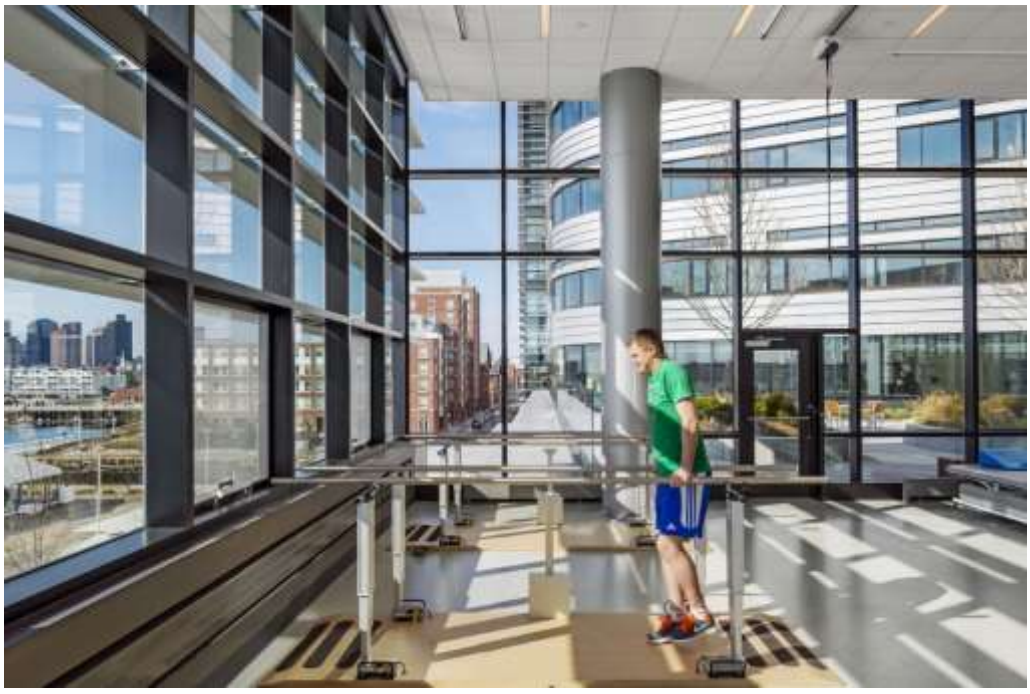


Figure 55: *good view of the exterior creates a calm atmosphere and helps the user in a faster recovery.*

Source: *(https://www.aiachicago.org/)*

When designing the building the designers had first put themselves into the shoes of the patients to fully understand the needs of the users so they could approach the design in a more informed way. They had spent a day in wheelchairs to get a better understanding of how some of the patients will utilize the spaces. The designers wanted to set a new standard for accessibility. The building features a lot of the cutting-edge technological advancements and also boasts the latest thinking in physical rehabilitation. There are activities such as aquatic group therapy, libraries and research areas for doctors and staff. To ensure that a patient is ready to live on their own the hospital features a mock apartment where patients can spend a night or two to give them the comfort and demonstrate whether the patient is ready to live on their own or not.

When designing this building the smallest of details were taken into consideration. The plumbing and counter tops were designed in a manner that allows for easy access to individuals in wheel chairs, Bathroom doors are automated by sensors and open by the wave of a hand, counter tops are also designed in a 'U' shape so that user friendly to individuals with wheelchairs. Sensors are fitted into rooms so that when a window is open the HVAC systems shuts down to allow for fresh air to enter the rooms.

The Spaulding rehabilitation center also utilizes nature and allows for individuals to connect with nature on a visual and physical level. The building also utilizes vast amounts of glass to ensure that the user constantly has a visual connection with the exterior surroundings. There is also a balcony on the 8th floor that is roughly 8500 square meters and open to both patients and visitors. Green roofs serve as an important part of the hospitals therapeutic functions as well as provides a good visual stimulus for observers from the upper floors.

Multiple spaces such as gymnasiums, multipurpose rooms and educational rooms are fitted automated openable windows for the utilization of natural ventilation. By having windows that are openable, this allows the building to maintain a comfortable temperature and still be functional even when the buildings HVAC systems are not functioning. The green roofs also reduce a lot of the stormwater runoff and reduce cooling loads.

The building also utilizes a wide range of different materials, textures and colors to allow for a modern and practical atmosphere. Since the context is very nautical, the building utilizes aluminum cladding to be depicted as a battleship. The goal of the architects was to create a sense of transparency between the interior and the exterior of the building to allow for integration between the community and the building itself.



The patient's rooms are comfortably designed for both the patient and their visitors. The rooms also allow for a view of the surroundings which contributes to the healing process. One of the materials that is used is timber, timber is used to give the rooms a warmer and cozy feel. The rooms are also given a homey feel with littles details such as potted plants. The spaces are also of a decent size so that its comfortable and ensures that patients don't feel restricted and claustrophobic.



Figure 56: *good view of the exterior creates a calm atmosphere and helps the user in a faster recovery.*

Source: *(https://perkinswill.com)*

5.3.6 Innovation through empowerment



Figure 57: *Custom designed pool to allow individuals with wheelchairs to engage in aqua therapy*

Source: *(https://www.archdaily.com)*

Almost every aspect of the design of this building has been researched to better understand the individuals that will be utilizing this facility. The building and its programs not only help in the rehabilitative process but also ensures that once these individuals leave, they are independent and confident. The Spaulding rehabilitation hospital represents rehabilitation and medicine in the new era by incorporating scientific innovation with human-centered and patient-centered design. This fusion of science and the consideration for patients puts this hospital in the high ranking of other major healing centers around the world. Spaulding rehabilitation center utilizes assistive technology to assist their patients in their recovery and help those who are new to a disability, thereby helping them adapt in a much more rapid fashion. Spaulding rehabilitation center is driven by the vision of helping their patients in their future and not only do they make use of assistive technology but they also use their labs for research to push the boundaries in rehabilitative care and design and access prosthetics that are not locally available. Spaulding rehabilitative center has a variety of programs that cater for a wide diversity of individuals with impairments.

The hospital had reached the ranking that it currently has by allowing therapists to collaborate with the Spaulding rehabilitations centers researchers. The hospital not only does trials with the technology but also produces feedback on how the technology can be improved for use with the different individuals.

Spaulding rehabilitation center has the following strategic priorities that can be seen as empowering to people:

- The enforcement of patient, relative, and employee empowerment through education.
- Making sure that environments are fully accessible for all individuals.
- Creating awareness about disability and involving the community.



Figure 58: *A view of the green roofs from within the hospital*

Source: *(https://perkinswill.com)*



Figure 59: *All facilities are designed using the principals of universal design to allow all users to utilize the facilities with ease*

Source: (https://www.archdaily.com)

5.3.7 Conclusion

Spaulding rehabilitation hospital caters for any kind of disability. The hospital highlights the importance of giving thought to every detail possible for the betterment of its patients. At Spaulding rehabilitation center, they customize your rehabilitation setting to suit every individual need that will help in reaching a maximum level of recovery. All care, from rehabilitation therapy, recreation to nutrition is patient centered. The center does more than the average rehabilitation center to ensure that their patients are more comfortable in their environments. This is done by the utilization of the most advanced techniques and the use of the most current and cutting-edge technology available. They also look at innovative and more creative ways of making use of the technology that will best suit the patients. If there is a new idea or method of rehabilitation, it is very likely that the team at Spaulding center is implementing it. these technologies range from simple assistive technologies to advanced robotics. The center is also used for research and this is useful because the data obtained from the therapy of their patients is used in the research and vice versa thereby allowing better treatment and therapy for the hospital's patients. The success of the hospitals inclusive design is also based on its locations where patients and the community can part take in sports together which make the community more involved in their recovery

CHAPTER 6.

KEY CASE STUDIES

CHAPTER 6 KEY CASE STUDIES

6.1 PATHWAYS



Figure 60: *A welcoming entrance that incorporates nature*

Source: *(https://www.pathways-kloof.co.za/photo-library/)*

Location: 1 Baden Road, Westville, 3630



Figure 61: *The location of pathways*

Source: *(https://www.google.co.za)*

6.1.1 Project description

Pathways is located Westville in a residential area on Baden Road. Being located in a residential setting the community is very involved with the facility. It is tucked away from public facilities and isn't easily accessible to the general public but it is a well-known facility allowing for the public to reach out with great ease, the staff and management are also very welcoming making it a very easy facility to get involved in. The facility started off as one home but grew to the point they had to acquire the neighbouring property and create a bigger facility to accommodate the larger numbers of students that they were getting

6.1.2 Justification of case study

Pathways is not just a care centre. They strive to stimulate and educated children with disabilities. The facility caters for a wide variety of disabilities, both physical and cognitive. Pathways had begun as a dream to aid and assist children who were severely disabled and provide support for their parents. Pathways is a non-profit organisation. The facility had initially started off with caring for 3 children and grew in 15 years to the point where they now cater for up to 70 children in 2020. Pathways now has eight schools around South Africa. Each of these schools are fully independent and have their own fund raisers.

6.1.3 Urban setting

The building is located in a residential location which is close to a main road but isn't accessible straight of the main road. The Management of the staff have stated that the location is perfect for their particular institute due to the fact that they have been in existence for a long time and the community form the immediate surroundings often get involved with the. This institute has become a part of the local community.

6.1.4 Legibility and Wayfinding

The building is structured whereby it has two wings. As you enter the building you enter into a central volume in which the user can decide which wing, they want to go to. The entrance is secured with an automated gate. For the parent and caregivers dropping of their children, the central point of entrance has a stair leading down to it, or the user can park their vehicle at the ramp provided to get to the entrance, this is to cater for wheelchairs and for individuals that are not physically mobile. Upon entering the facility, you are greeted with very pleasant atmosphere and great scenery of a nature backdrop which is visible through the glazed walls.

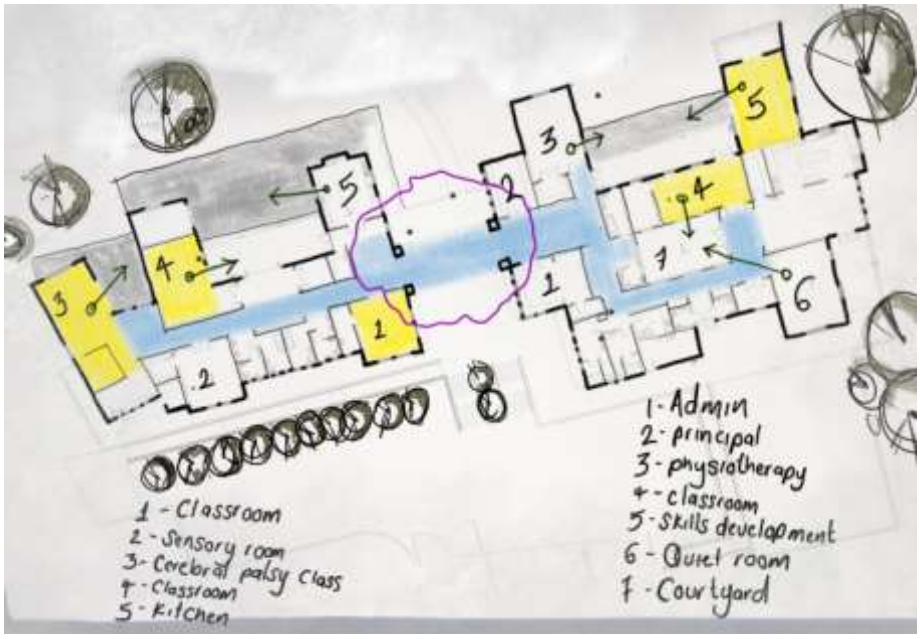


Figure 62: *Plan showing relation of classrooms, spill out spaces and circulation*

Source: *(Author)*

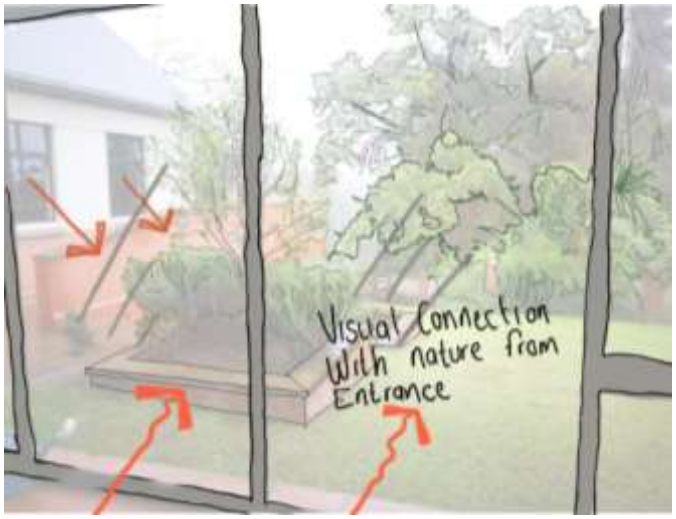


Figure 63: *A view of nature though the big panes of glass from the entrance*

Source: *(Author)*

The two wings are to cater for different individuals. The west wing caters for in individuals that are not wheelchair-ridden and are mobile while the East wing caters for individuals in wheel chairs. Each wing has its own ablutions which are all designed for paraplegic users including the staff toilets which shows that this facility is able to cater for staff that have disabilities as well. Each wing has its own spacious kitchen in which the staff members use to bake with the children as a form of activity. The corridors are wide enough to accommodate at least two wheelchairs at a time.

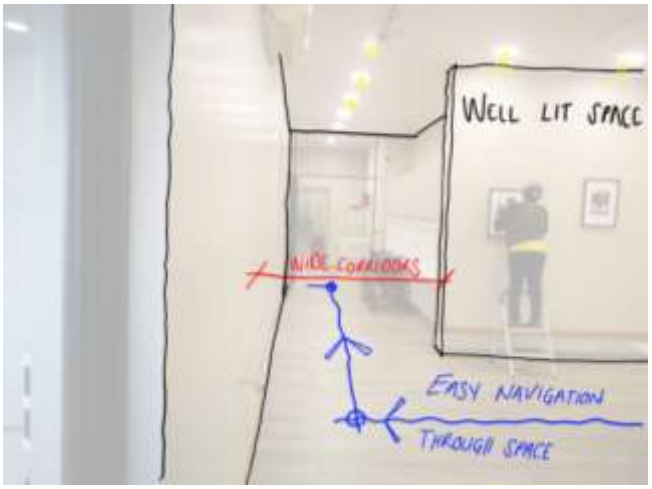


Figure 64: *Wide well-lit corridors to allows for wheelchairs to easily move through spaces*

Source: *(Author)*

The subsections on each wing is gated of in case that section needs to be restricted temporarily. The division of the building into two wings make the building easy to navigate. There are also active staff members who are friendly and willing to assist so there is no difficulty in finding your way around this facility.

The architect of the building took the surrounding context into account when designing the facility and designed the building in a manner that doesn't look or feel institutional. The aesthetics of the building looks residential because the facility is designed to look and feel like a home away from home. The architect had also designed the facility around the children who would be utilizing the facility. The staff toilets are placed away from the children's toilet. The children's ablutions are also central to each wing so there is always awareness of who goes into the toilet and the management always know how long each member is in the ablutions, this was to ensure the safety of the children at the facility.

6.1.5 Contact with nature

With regards to nature the facility is set in the context of very green spaces. All spaces towards the north of the facility have a great view of nature. When entering the building the user is greeted with well cared for plants. The outdoor play areas are in very soft, calm and green spaces with trees and plants all around. The facility also encourages gardening of herbs which is used as an activity for the users to engage with nature and get their hands dirty. The Heated pool and the trampolines which are used for motion stimulation is at the back of the facility in the context of nature. On the side, a playground where the children often play and where fundraising events are often held has a lot of plants and this creates a very calm natural environment that is beneficial to the users of this facility. The east wing has a central courtyard which is utilized for planting of little plants and to liven up the interior spaces of the facility.

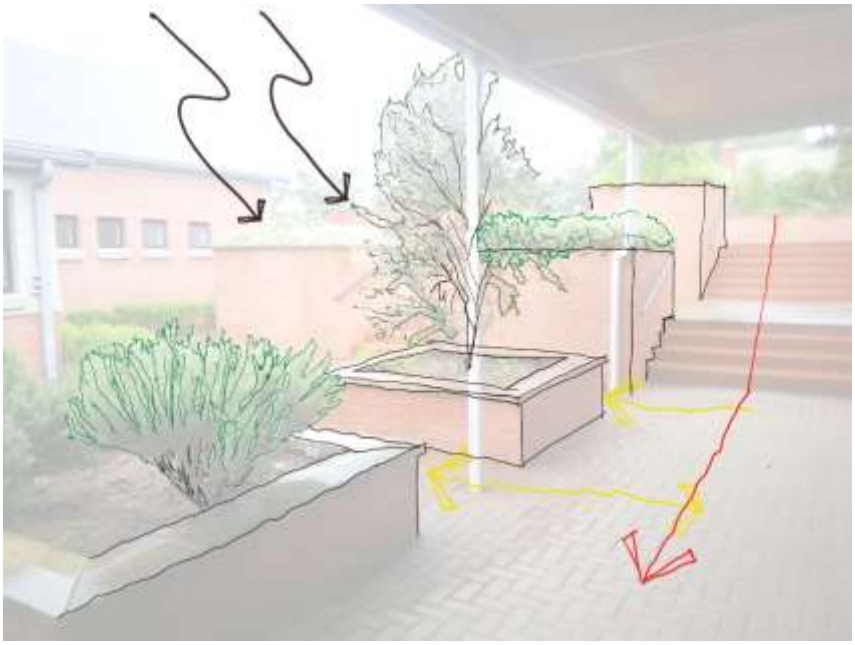


Figure 65: *A welcoming view from the entrance that incorporates nature*

Source: *(Author)*



Figure 66: *A view from the balcony to the garden*

Source: *(Author)*



Figure 67: *The playground that incorporates nature*

Source: *(Author)*

6.1.6 Enhancing the experience of the building

The facility makes use of a lot of outdoor spaces. Interior spaces that open out onto balconies or porches. This allows the caregivers to take the children from an interior space out onto a breakaway space for a change in atmosphere and a change in activity. The facility also has a sensory room that all children are exposed to at least once in two weeks. Adding more sensory rooms to the facility may be beneficial to the facility, this is deduced from the success of the current sensory room.

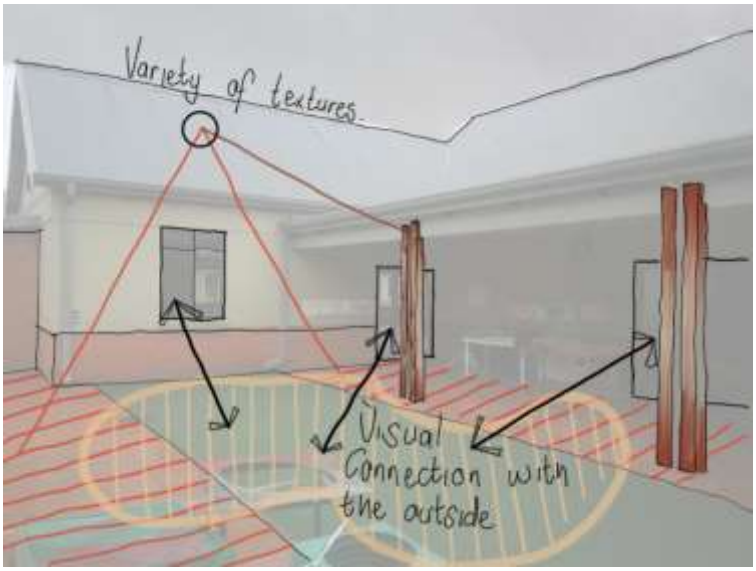


Figure 68: *Spill out spaces that feature a variety of textures for tactile experience, and a visual connection between the interior and exterior spaces*

Source: *(Author)*

6.1.7 The psychological effects of colour and materials

The colour scheme of the building is very subtle to cater for all individuals with disability and runs through the entire building. The subtle colour creates a neutral and calm environment that users feel comfortable in. The facility also utilises a lot of glazing to create views of the outside. This has a positive effect for the children that attend the facility.

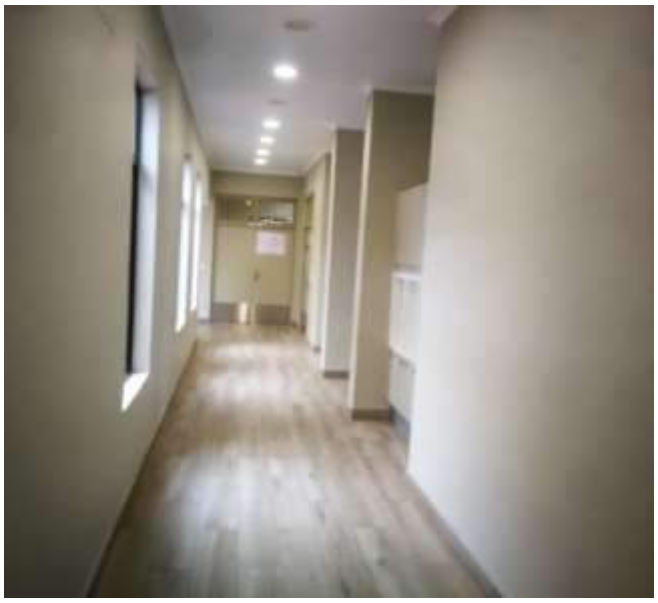


Figure 69: *Wide corridors to allow for easy wheelchair mobility and pastel colours to create a calm environment*

Source: *(Author)*

6.1.8 Conclusion

This facility was designed with the consideration of severely disabled children in mind. The facility is almost completely accessible by everyone. There is only one area in which the existing ramp isn't in keeping with regulations, but regardless of that, with help, someone with a wheelchair will still be able to utilize that ramp. The facility is easy to navigate through, the colour scheme isn't intimidating and overall contributes to a tranquil environment for healing and learning. The staff members are very involved with the children. Attending the facility changes the mood of the children and often times the children don't want to leave when it's time for them to leave. This is an indication of a successfully designed building. It shows that the users are in a space of comfort. This is a combination of well-designed spaces as well as caring staff that create a family bond with the children.

6.2 SAINT GILES



Figure 70: *Location in context 4 Prince Street, point, Durban*

Source: *(https://www.google.co.za)*



Figure 71: *View from the road*

Source: *(https://www.google.co.za)*

6.2.1 Project description

In 1952 the organisation was founded by former journalist Kerry Malt who was disabled. Kerry had understood the challenges that Individuals with disabilities had faced which led him to start visiting the sick in homes and hospitals. Saint Giles has developed over a period of time and was founded in 1962. Their mission statement Is “to provide services and support to disabled persons from all communities.” This organisation recognises disability as any person who is restricted in their ability regardless of whether it is physical, mental or social.

6.2.2 Justification of precedent study

The organisation is a non-profit organisation and relies on the support of the public as well as the work centre a charity shop. The work centre at saint Giles had started up due to very generous donations and has been providing disabled people with employment opportunities.



Figure 72: *The charity shop at the entrance of the facility*

Source: *(Author)*

6.2.3 Urban setting

Saint Giles is located in Durban CBD on the corner of prince street and bell street. By having a central location, it is more accessible to the public. It sits on a transport route which makes it easier for others to get to the facility. Taxies use this road as a thoroughfare which has a contribution to business on that street. Parking however, is limited on site which proves to be inconvenient to people who wish to visit the facility.

6.2.4 Legibility and wayfinding

The building is structured such that all the necessary amenities for individuals with physical amenities are on the ground floor making it easily accessible and all the offices are on the first floor. Upon entry visitors are required to fill in a register to state reason for visit. They are then directed based on where they want to go. The public access is controlled by the use of access gates. This also prevents the public users from getting lost within the building. The building also utilizes signage to point the user to different spaces. Wayfinding isn't the most ideal in this facility. Navigating from one space to another can be confusing and the circulation isn't clear



Figure 73: *Work centre where the physically impaired and able-bodied individuals work together*

Source: *(Author)*

6.2.5 Contact with nature

With regards to contact with nature the facility doesn't integrate its users with nature in an effective manner. The design shows very little connection to context and with natural elements. The Durban beachfront is in close proximity to the facility and the facility doesn't pay recognition to that. The building does not embrace interaction with nature and outdoor spaces. The building does however, utilize large windows which allow natural light and natural ventilation.



Figure 74: *The work spaces allow for a lot of natural light to enter and create a more naturally lit environment to work in*

Source: *(Author)*

6.2.6 Enhancing the experience of the building.

The building utilizes automated doors to allow for more friendly access points which also make the transitioning between spaces simpler for individuals that utilize wheelchairs. The corridors are wide to allows for mobility of wheelchair users and people walking simultaneously. The intention of the colour in the building was to add vibrance to the spaces however this just creates a sense of uneasiness in those spaces. The spaces give more consideration to the practicality of the materials rather than the aesthetical quality of the spaces.

The facility aims to give individuals with physical impairments a chance at being self-sufficient. They work as equals in the facility as permanent workers. Not only does the facility provide jobs for them but it also has a work centre which can be used to further develop any skills that the employees may have.

6.2.7The psychological effects of colour and material

Both interior and exterior facades make use of plaster and bright colours. The bright colours are used to bring a sense of vibrancy to the space and to liven up the users spirits as oppose to mundane colours. Based on the literature review, bright bold colours may have an inverse effect. The bright colours may create a sense of uneasiness and put the user on edge. The facility uses mirrors to add volume to a room to create the illusion of a more open space. In the staff room cool colours and a painting of the ocean portray a more tranquil environment

6.2.8 Conclusion

The saint Giles organisation takes disability treatment a step further. Apart from healing and upliftment. The facility provides employment for individuals with physical impairment and allows them to prove themselves to society. Some of the individuals working at the facility are the bread winners in their families. Not only does the facility provide employment but the staff and workers have grown fond of each other and are now more of a family. The users of the building, be it patient, staff or visitor utilise the building and are relatively comfortable. However, from an architectural point of view the facility could be designed in a way that will prove more beneficial to its users. Being a facility that caters for individuals with disability, the facility should have break away spaces for a change in atmosphere to allow for a more calming environment. The colour scheme is too intimidating to the users. Subtle pastel colours would create a more calming environment for the workers and the public. The facility is close to the beach and has the opportunity to engage the public but due to its hard street edge this facility doesn't look or feel welcoming to the general public.

CHAPTER 7.

ANALYSIS AND DISCUSSION



Figure 75: *analyzing all data collected*

Source: *(https://ceils.ucla.edu/event/ceils-discussion-group/)*

CHAPTER SEVEN: ANALYSIS AND DISCUSSION

7.1 INTRODUCTION

This chapter will look at the interviews that were conducted at Pathways centre for children with disabilities and Saint Giles organisation for the disabled. It will also look at the questionnaires that were completed by the staff members and caregivers of these institutes and professionals in the field of architecture. The data that has been collected from Pathways and Saint Giles has provided a set of guidelines for an appropriate brief which is relevant to designing a facility for social integration and transition into adulthood of individuals with physical impairments in Durban. A facility that not only allows for social integration but also creates awareness about individuals with physical impairments. Interviews with professionals that were involved in the designing of the facility has also provided useful information with regards to what is required when designing a facility for the physically impaired. Theories and concepts were also used in analysing the precedent and case studies to further understand the suitability of the solutions derived with regards to the empowering of individuals with physical impairment both socially and architecturally. This chapter will analyse the most significant responses from the questionnaires and interviews.

The literature review as well as the primary and secondary data aims to address the main problem statement of this dissertation and answer the main question of this dissertation in the process.

“Transitioning into adulthood is a very vulnerable moment for any individual, during this transition an individual is expected to take responsibility for themselves. This is a very crucial time for them because the decisions they make in this time can have a lasting effect on the life they live. This transition is particularly difficult for individuals with any form of physical impairment, especially those that have not been equipped with skills to get by daily life, skills that relate to employment and being self-sufficient.

There is also a lack of a nurturing environment to equip individuals with physical impairment with the skillset they require for daily life. This is due to a lack of spaces that are conducive for their learning and fitness because the way these individuals utilize spaces and the built environment is much different from a regular person. These individuals who struggle to be a part of society as is, are further disconnected by not being given the necessary skillset they need to survive independently. It is essential to provide conducive, nurturing learning spaces for this group of people to gain the required skillset that is needed in the 21st century to get by day to day and allow them the opportunity to build a better life for themselves.”

How can the built environment be adapted in the 21st century to assist the physically impaired in their transition into adulthood?

7.2 ANALYSIS OF RESEARCH FINDINGS

From the data collected in the literature review, precedent studies, and case studies, it can be concluded that individuals with physical impairments possess the ability to learn new skills. Skills that are related to the 21st century technology. These skills will also help them to be self-sustainable in the 21st century and not just get paid the minimum wage. The built environment should allow for easy access and provide the physically impaired with the tools they need to develop new skills. Majority of these individuals are capable of learning new skills but are not given the opportunity to improve themselves due to the stigma attached to disability. The built environment should also be socially inclusive to all people.

APPENDIX 1

Question 9: Does your facility encourage social integration between the public and the occupants, if so, how?

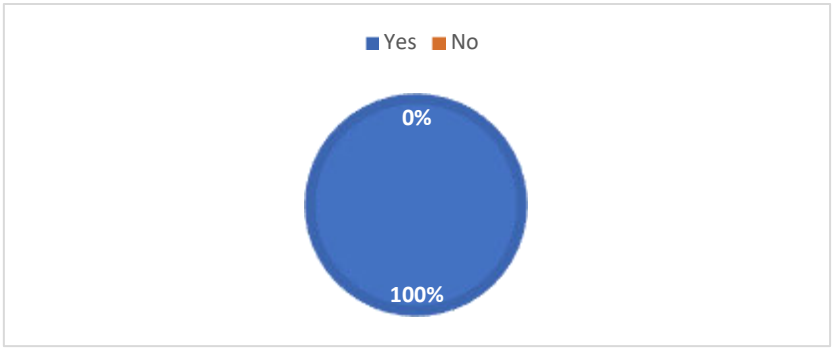


Figure 76: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

The results indicate that both facilities encourage social integration regardless of their difference in nature. This indicates that the Management staff and caregivers who have first-hand experience with individuals with physical impairments know that social interaction is beneficial to these individuals as well as the physically impaired society in general.

HOW?

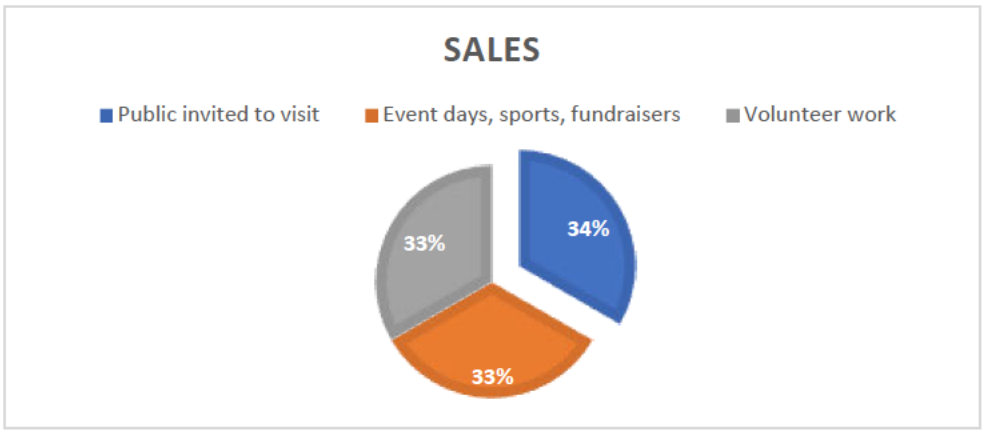


Figure 77: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

Question 17: Is there any further information you could provide that would benefit this research

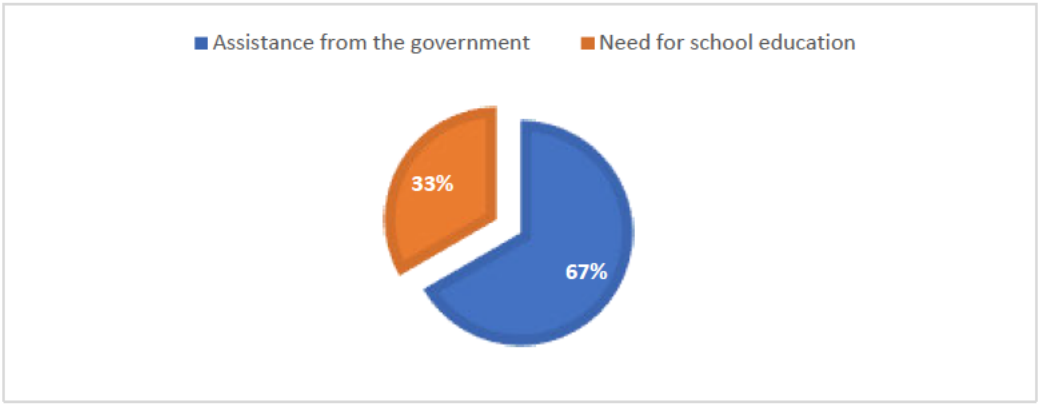


Figure 78: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

Between the two Case studies, the management struggles with funding and require assistance from the government. This will allow them to cater for more individuals with impairments. Resulting in more individuals being trained with skills to work in the 21st century or simply become self-sufficient.

APPENDIX 2

Question 12: As a staff member or caregiver, do you think more people need to be educated about the physically impaired population?



Figure 79: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

The results indicate that both facilities believe that the general public needs to be educated about the physically impaired population. This is proof of data obtained in the literature review. It is also indicative that more needs to be done to create awareness about the existence of the physically impaired as well as their true capabilities to be treated as equals.

Question 13: If so, how would you educate the public about the physically impaired population

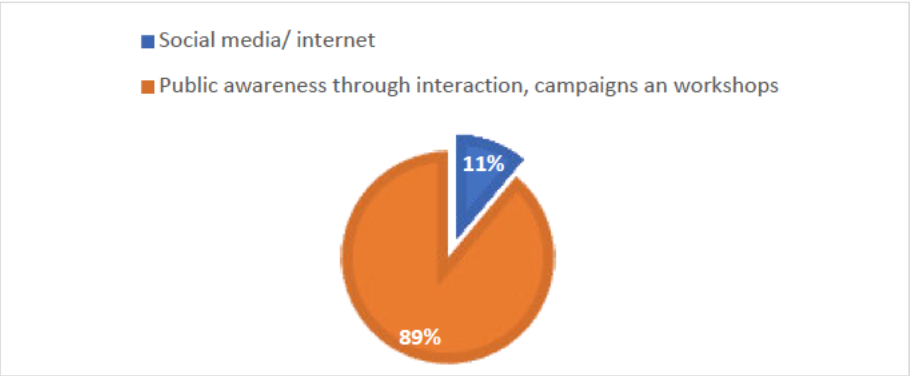


Figure 80: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

Question 15: Would you consider being trained with skills that are trending in today's generation and then passing your knowledge to the individuals with impairments (skills such as, a social media influencer, prosthetics, recreational and educational activities) dealing with the advancement in the technological field, digital art etc?

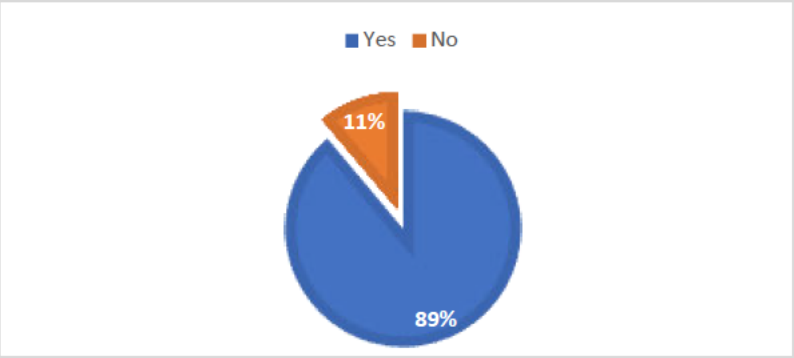


Figure 81: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

The results show that majority of the staff and caregivers are keen on learning new skills regarding technology in the 21st century and are willing to pass their knowledge onto the individuals that they provide support to. They are just not presented with an opportunity to learn new skills. With the advancement in technology the job opportunities are endless even for individuals with physical impairments.

Question 17: Is there any further information or comments that you could provide that would benefit this research?

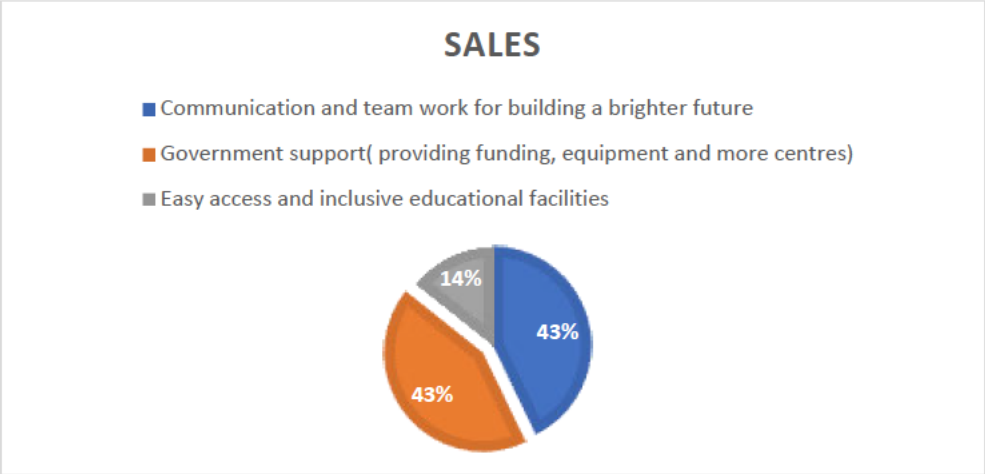


Figure 82: *(This picture shows the percentage of interview samples collected in relation to providing an appropriate facility).*

Source: *(Author)*

The staff members and caregivers who have first-hand experience with individuals with impairments believe that these individuals are capable of learning new skills to different extents and that everyone needs to work together in creating a brighter future for them. It is also not cheap to provide support to individuals with physical impairments and that is a concerning issue to the institutes that cater for impairments. They require more funding but this is a small price to pay for a lifetime of an individual. Training them to work or be self-sufficient will ensure that they are no longer viewed as a burden on society and by working they will be able to support themselves as well as others.

7.3 DISCUSSIONS AND THEORETICAL IMPLICATIONS

How can the built environment be adapted in the 21st century to assist the physically impaired in their transition into adulthood?

The theory of universal design was explored to understand the dynamics of designing a facility that can be utilized by all individuals regardless of their race, age or even the type of impairment that they have. Universal design had not encountered for the rapid advancement of technology in the 21st century, thus with the introduction of assistive technology and the rapid advancement

of technology, the lives of individuals with impairments can be made a lot easier by combining the top-down approach of universal design and the bottom-up approach of assistive technology. With the introduction of the fourth industrial revolution, it is important to set the framework for the future and design in a Human-centred manor to avoid the negatives of the fourth industrial revolution over-powering the positives of the fourth industrial revolution which also aims to assist and empower people.

Technology is changing the world and is able to reduce the barriers that individuals with physical impairments face in their daily lives. It allows them to access the digital world. They now have access to the same information as everyone else. New technology can allow for individuals with physical impairments to be more independent.

With the data gathered from the precedent and case studies, it can be concluded that majority of individuals with physical impairments are capable of learning new skills. The built environment isn't accommodating the physically impaired population. It was found that Accessibility, funding and awareness are the biggest problems.

By looking at the manner in which job opportunities are presented in VA Palo Alto and saint Giles, it can be concluded that individual with physical impairments could develop skills for their future life of independence if the built environment allowed for it. In order for 21st century technology to play a part in enhancing the lives of individuals with physical impairments the built environment must first be universally accessible

The built environment can act as a platform to create social cohesion, bringing both the able-bodied individuals and the physically impaired individuals together.

What are the spatial requirements for the physically impaired to develop skillsets for the 21 century?

Based on the data collected from the literature review, precedent and case studies, it can be concluded that majority of individuals are capable of learning new skills that are required to get jobs in the 21st century. The environment they require to develop these skills proved to be important due to the fact that some individuals may absorb information slower than others.

Based on data gathered from the precedent study, the spatial requirements need to have a sense of hierarchy in terms of navigation. VA Palo alto enforces this concept to train the user to adapt in new environment. This is not to be confused with making spaces difficult for the user to manoeuvre around. This is simply to train the user in being independent

In the case studies Saint Giles and Pathways. Pathways featured Subtle colours for the rooms to create a more neutral and calmer environment, break-away spaces allow for a change in pace and atmosphere. This is in the event that an individual becomes overwhelmed at any point in time. Good views to the outside help in creating a less stressful environment and has proved to be successful in a faster recovery rate for individuals with physical impairments. Navigation between spaces were also be considerate of how individuals with physical impairments move through spaces. Spaces for learning should are not cluttered. Corridors should be wide enough to allow for at least 2 individuals with impairments and helpers to move through at the same time.

To understand what affects the role of globalisation and technology have on the built environment?

Faster transfer of information. Globalisation and the fourth industrial revolution aim to empower and connect people. With faster communication, the success and failure of a particular system in the built environment or dealing with physical impairments spreads at a more rapid rate.

In the past it used to take decades for the success and failure of architecture to travel globally. Now the process is almost instantaneous. Feedback about a building can be given from the public or professional without the building even having to be erected. Social media is also a technological asset to the built environment. The built environment, regardless of its typology, can now work together with 21st century technologies to create awareness on a more rapid scale and drive social integration.

The data gathered from the precedent and case studies suggest that more and more for facilities that cater for the physically impaired are emerging and designers in the 21st century are always looking at pushing innovation to assist the physically impaired. With the rapid transfer of information, social media and the instant availability of information, buildings like Spaulding rehabilitation centre were able to utilize assistive technology devices as well as access and design prosthetics that were not locally available. This shows the benefit that globalisation and technology will have for individuals with physical impairments in the future.

How can architecture and technology aid in creating inclusive environments?

With the emergence of new technologies and new innovative systems, architecture an 21st century technologies can create a more inclusive environment with greater ease. Technology

and architecture can provide a platform that brings the able-bodied and the physically impaired together. Spaulding rehabilitative hospital has opened 70 percent of its ground floor to the public, bringing in the general public. Similarly, Saint Giles has a non-profit gift shop which the public utilizes. It is evident that the introduction and a variety of activities on a single architectural platform can bring a diverse group of people together. By doing this, the general public is exposed to disability more often, resulting in a change in perspective towards disability. This will lead to a more fluid and genuine interaction between the physically impaired population and the able-bodied population. This inclusivity extends beyond disability. The fusion of architecture and technology creates socially inclusive environments for all diversities of people, regardless of age, nationality, disability and gender.

Architecture and technology aid in creating inclusive environments by sparking interest in individuals, creating a level of curiosity and allowing for interaction both verbally and digitally by utilizing the current trends attached to social media

7.4 CONCLUSION

The primary data obtained through interviews, discussions, precedents and case studies are an important factor in understanding the concepts and theories discussed in this dissertation. It also provides direction in how to go about designing an empowerment academy for the individuals with physical impairments transitioning into adulthoods.

CHAPTER 8.

CONCLUSIONS AND RECOMMENDATIONS



Figure 83: *(conclusion of findings).*

Source: *(https://www.dreamstime.com)*

CHAPTER EIGHT: CONCLUSIONS AND RECOMMENDATIONS

8.1 INTRODUCTION

This dissertation set out to explore how the built environment can be adapted in the 21st century to assist the physically impaired in their transition into adulthood. The information this study has obtained was through the literature review, precedent studies and case studies. These have proved to be useful in understanding how he built environment and technology can aid individuals with physical impairments in their transition into adulthood in the 21st century.

8.2 CONCLUSIONS

This research looks at how the built environment can be adapted in the 21st century to help individuals with physical impairments in transitioning into adulthood. The theory of Universal design, empowerment and Phenomenology were explored.

The theory of universal design was explored to understand the dynamics of designing a facility that can be utilized by all individuals regardless of their race, age or even the type of impairment that they have. Universal design had not encountered for the rapid advancement of technology in the 21st century, thus with the introduction of assistive technology and the rapid advancement of technology, the lives of individuals with impairments can be made a lot easier by combining the top-down approach of universal design and the bottom-up approach of assistive technology. With the introduction of the fourth industrial revolution, it is important to set the framework for the future and design in a Human-centred manor to avoid the negatives of the fourth industrial revolution over-powering the positives of the fourth industrial revolution which also aims to assist and empower people.

The theory of empowerment in this research deals specifically with individuals with physical impairment. The investigation is carried out such that the problem is understood thoroughly and critically from both perspectives (the physically impaired and the able-bodied). This is to ensure a development of strategies for a solution. This translates to the built environment. The strategies investigated look at how spaces of empowerment can be designed to empower individuals with physical impairments in the 21st century.



This then leads to the next theory of phenomenology and how this universally accessible space of empowerment can be designed in a manner that is beneficial to individuals with physical impairments. The theory of multisensory design is explored in depth and taken a step further into sensory design fused with exploration and volume. This theory gives critical information on materiality, experience, vibrance and atmosphere when designing spaces for people regardless of their impairment, age, sex or nationality.

The precedent selected were chosen due to its relevance to the proposed typology. The findings indicate that the lack of awareness of impairments is an issue and that the public inclusion into the facility is beneficial to the physically impaired population. Both buildings show how innovation and technology as well as a building designed with the principals of universal design have improved the recovery rates of individuals with physical impairments.

8.3 RECOMMENDATIONS

The following guidelines will provide an understanding towards the designing of an empowerment academy in Durban, South Africa. It is important to understand the context and surrounding that is required when designing the empowerment academy. This was determined through the research done for the literature review. The finding will also be used for criteria in site selection for the proposed empowerment academy

- Sense of place: a positive sense of place must be provided for the users of the facility
- Skills development: The process of developing new skills should empower people
- Social integration: the facility should feature a variety of activities to bring in a diverse group of individuals.
- Training spaces: Spaces should be adaptable along with the implementation of technology to allow for spaces to be extended according to events and activities.
- Prosthetic interaction and training: Spaces to allow for newly impaired individuals to learn and train with prosthetics in a conducive space before going out into the world.
- Controlled environments: With interchangeable spaces and a variety of volumes and light to allow for new technology such as holograms and virtual reality, as well as to creates a sensual experience through spaces
- Service and repair: A facility that is dedicated to the maintenance of 21st century technological devices such as 3d printers and drones

- Public spaces: The inclusion of private and public spaces that relate to the local context and the programmes to allow spill out spaces.

8.4 SITE SELECTION GUIDELINES

An empowerment academy is essentially a place where individuals with physical impairments as well as able-bodied individuals learn skills for work in the 21st century that will help them in their transition into adulthood. The secondary function is just as important as the primary function so the site needs to be in an already socially successful space to allow for a strong social environment all hours of the day to create awareness about the physically impaired community and to allow for social cohesion between the able-bodied community and physically impaired community. The site selection criteria have been derived from various sources such as the literature review of this research document, the precedent studies, and the case studies.

The social realm: The site should be in a vibrant and socially successful context.

Accessibility: The site should be on route of public transport and allow for easy access to private transport. It should be fully accessible to pedestrians.

Site allowances: The site should allow for a design that isn't affected by topography while allowing for orientation that maximises comfort and good views to create a calmer environment both interior and exterior.

8.5 CONCLUSION

The criteria for site selection help to indicate ways in which architecture can facilitate the training and social cohesion of individuals with physical impairments and able-bodied individuals in the context of 21st century technologies.

9. REFERENCES

Books

2018. *Learners at Special-Needs Schools Research Brief.* South Africa. [Accessed 4 Sep. 2019].

Couto, R., 2010. *Political And Civic Leadership*. Thousand Oaks, Calif.: SAGE Publications, pp.207-218.

Devandas, C., 2016. *The Inclusion Imperative: Towards Disability-Inclusive and Accessible Urban Development Key Recommendations for An Inclusive Urban Agenda*. CBM. Available at: <http://disabilityrightsfund.org/wp-content/uploads/2016/11/The_Inclusion_Imperative__Towards_Disability-Inclusive_Development_and_Accessible_Urban_Development.pdf> [Accessed 19 May 2020].

Dolmage, J., 2017. *Academic Ableism*. Ann Arbor [Michigan]: University of Michigan Press.

Fowler, S., 2006. *Sensory Stimulation Sensory-Focused Activities for People with Physical and Multiple Disabilities*. London and Philadelphia: Jessica Kingsley Publishers.

Kreij, K., 2010. *Sensory Intensification in Architecture*. The Hague.

Luttrell, C., Quiroz, S., Scrutton, C. and Bird, K., 2009. *Understanding Empowerment and Operationalising Empowerment*. London: Overseas Development Institute 2009.

Masango, S., 2018. Some of the challenges faced by disabled persons. *Rise 'n Shine disability magazine*, [online] Available at: <http://risenshine.org.za/2018/08/06/some-of-the-challenges-faced-by-disabled-persons

Nygaard, K., 2018. *What Is Universal Design Theories, Terms And Trends*. Oslo, Norway: Creative Commons Attribution 4.0 International License.

Pallasmaa, J. 2005. Eyes of the Skin: Architecture and The Senses. Great Britain: Wiley-Academy.

Ryan, F., 2014. Two-thirds of us are uncomfortable talking to disabled people: we need time, money and effort to get over the awkwardness. *NewStatesman*, [online] Available at: <https://www.newstatesman.com/voices/2014/05/two-thirds-us-are-uncomfortable-talking-disabled-people-we-need-time-money-and-effort> [Accessed 19 May 2020].

Story, M., Mace, R. and Mueller, J., 1998. *The Universal Design File*. [North Carolina]: NC State University, Center for Universal Design.

Sung, C., Ditchman, N., Lee, G. and Lee, E., 2020. *Challenges Facing Young Adults With Intellectual & Developmental Disabilities Transitioning Into Adult Life: The State Of The Research*. Illinois Institute of Technology: Michigan State University,

Blogs

Bricklin, D., 2000. Thomas Friedman's view of globalization. [Blog] *Dan Bricklin's Log*, Available at: <http://www.bricklin.com/albums/fpawlf2000/friedman.htm> [Accessed 11 Feb 2020].

Mack, L., 2019. 12 of the biggest challenges people with disabilities face when pursuing an office job. [Blog] *Insider*, Available at: <https://www.insider.com/challenges-for-people-with-disabilities-who-have-office-jobs-2019-8> [Accessed 19 May 2020].

MCGINNIS, D., 2018. What Is the Fourth Industrial Revolution?. [Blog] *salesforce blog*, Available at: <https://www.salesforce.com/blog/2018/12/what-is-the-fourth-industrial-revolution-4IR.html> [Accessed 1 March 2020].

Rise blog, n.d. Barriers to employment for adults with disabilities. Available at: <https://riseservicesinc.org/barriers-to-employment-for-adults-with-disabilities/> [Accessed 20 May 2020].

Sensory Blog. (2019). *The Benefits Of A Sensory Room*. [online] Available at: https://www.experia-innovations.co.uk/blog/the-benefits-of-a-sensory-room/ [Accessed 23 Sep. 2019].

Internet pages

2009. Social isolation and technology. *Pew research center*.

Ablegamers.org. (2020). *S-S-S-S-Stigma Breaker: Gamers with Disabilities Are Taking the Fighting Game Scene By Storm | The AbleGamers Charity*. [online] Available at: https://ablegamers.org/stigmabreaker/ [Accessed 11 Feb. 2020].

ArchDaily. n.d. *Spaulding Hospital / Perkins+Will*. [online] Available at: <https://www.archdaily.com/443408/spaulding-hospita-perkins-will> [Accessed 28 July 2020].

Architectmagazine.com. 2015. *Spaulding Rehabilitation Hospital*. [online] Available at: <https://www.architectmagazine.com/project-gallery/spaulding-rehabilitation-hospital-6661> [Accessed 28 July 2020].

Bell, B., 2019. *Benefits Of Sensory Rooms & Spaces For Special Needs*. [online] Enabling Devices. Available at: <https://enablingdevices.com/blog/benefits-sensory-rooms-special-needs/>

Bricklin, D., 2000. Thomas Friedman's view of globalization. [Blog] *Dan Bricklin's Log*, Available at: <http://www.bricklin.com/albums/fpawlf2000/friedman.htm> [Accessed 11 Feb 2020].

Bucknell, A., 2018. *Architecture You Can Smell? A Brief History Of Multisensory Design*. [online] Metropolis. Available at: <https://www.metropolismag.com/architecture/multisensory-architecture-design-history/> [Accessed 30 May 2020].

Copp, K., 2018. *Empowering Vulnerable Citizens In Smart Cities*. [online] Smart Cities World. Available at: <https://www.smartcitiesworld.net/special-reports/special-reports/empowering-vulnerable-citizens-in-smart-cities> [Accessed 19 May 2020].

Development Asia. n.d. *A Shared Space To Bring Together People With And Without Disabilities*. [online] Available at: <https://development.asia/case-study/shared-space-bring-together-people-and-without-disabilities> [Accessed 28 August 2020].

Enabling Village. 2015. *The Enabling Village*. [online] Available at: <https://enablingvillage.sg/the-enabling-village/> [Accessed 28 August 2020].

Ganann, M., 2019. *ATEC (Assistive Technology Center) - Assistive Technology And Equipment , In Charlestown Massachusetts - Disabilityinfo.Org*. [online] DisabilityInfo.org. Available at: <https://disabilityinfo.org/records/atec-assistive-technology-center/> [Accessed 28 July 2020].

Gatchalian, C., 2019. *Assistive Technologies In The 21St Century*. [online] Techandcurr2019.pressbooks.com. Available at: <https://techandcurr2019.pressbooks.com/chapter/21st-century-assistive-tech/> [Accessed 28 April 2020].

Glas, K., n.d. The Future Of Assistive Technology - TFOT. [online] TFOT. Available at: <https://thefutureofthings.com/10057-the-future-of-assistive-technology/> [Accessed 28 April 2020].

Hansen, R., 2014. To persons with disabilities, perception is everything. *The globe and mail*, [online] Available at: <https://www.theglobeandmail.com/opinion/to-persons-with-disabilities-perception-is-everything/article21903250/> [Accessed 11 Feb 2020].

Hooson, A., 2018. *The Benefits Of Multi-Sensory Environments | Rhino Sensory UK*. [online] Default Store View. Available at: <https://www.rhinouk.com/blog/the-benefits-of-multi-sensory-environments/> [Accessed 25 May 2020].

https://www.nichd.nih.gov/. 2018. How Does Rehabilitative Technology Benefit People With Disabilities?. [online] Available at: <https://www.nichd.nih.gov/health/topics/rehabtech/conditioninfo/help> [Accessed 9 April 2020].

Ilo.org. 2003. *The Social Dimension Of Globalization*. [online] Available at: <https://www.ilo.org/public/english/wcsdg/globali/globali.htm> [Accessed 11 Feb 2020].

Jeff Teraoka, M., Spaid, S., Costello, B. and Chung, H., 2020. *Veterans Affairs Palo Alto Polytrauma And Blind Rehabilitation Center*. [online] SmithGroup. Available at: <https://www.smithgroup.com/projects/veterans-affairs-palo-alto-polytrauma-and-blind-rehabilitation-center> [Accessed 10 July 2020].

Kayla Matthews, K., 2019. *The Connection Between Smart City Infrastructure And Accessibility - Smart City Hub*. [online] Smart City Hub. Available at: <http://smartcityhub.com/collaborative-city/connection-smart-city-infrastructure-accessibility/> [Accessed 19 May 2020].

Keller, T., Cusick, G. and Courtney, M., 2007. *Approaching The Transition To Adulthood: Distinctive Profiles Of Adolescents Aging Out Of The Child Welfare System*. [online] US National Library of Medicine National Institutes of Health. Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2802332/> [Accessed 8 April 2020].

Lehman, M., 2020. *How Sensory Design Can Help Responsive Architecture Be More Effective*. [online] Mlldesignlab.com. Available at:

<https://www.mlldesignlab.com/blog/how-sensory-design-can-help-responsive-architecture-be-more-effective> [Accessed 25 May 2020].

Leonard, H., Foley, K., Pikora, T., Bourke, J., Wong, K., McPherson, L., Lennox, N. and Downs, J., 2016. *Transition To Adulthood For Young People With Intellectual Disability: The Experiences Of Their Families*. [online] SpringerLink Search. Available at: <https://link.springer.com/article/10.1007/s00787-016-0853-2> [Accessed 8 April 2020].

Marinova, E., 2019. *Multi-Sensory Design – Building For All Senses | Re:Public*. [online] Re:public. Available at: <https://www.re-publicspace.com/multi-sensory-design-building-for-all-senses/> [Accessed 1 June 2020].

O Sullivan, M., 2015. *The Potential Benefits Of Mobile Devices And Apps For People With Disabilities*. [online] Medium. Available at: <https://medium.com/@miriamosullivan/the-potential-benefits-of-mobile-devices-and-apps-for-people-with-disabilities-5e5639e0307d> [Accessed 8 April 2020].

Overman, D., 2019. *Equipped For Excellence*. [online] Rehab Managment. Available at: <https://www.rehabpub.com/clinic-management/practice-development/equipped-for-excellence/> [Accessed 28 July 2020].

Perkinswill.com. n.d. *Our Purpose – Perkins And Will*. [online] Available at: <https://perkinswill.com/our-purpose/> [Accessed 28 July 2020].

Perkinswill.com. n.d. *Spaulding Rehabilitation Hospital – Perkins And Will*. [online] Available at: <https://perkinswill.com/project/spaulding-rehabilitation-hospital/> [Accessed 28 July 2020].

Rawlins, R., 2018. *What Stephen Hawking Taught Us About Living With Disability | Living With Brain Injury | Brainline*. [online] BrainLine. Available at: <https://www.brainline.org/blog/learning-accident/what-stephen-hawking-taught-us-about-living-disability> [Accessed 20 May 2020].

Ryan, F., 2014. *Two-Thirds Of Us Are Uncomfortable Talking To Disabled People: We Need Time, Money And Effort To Get Over The Awkwardness*. [online] Newstatesman.com. Available at: <https://www.newstatesman.com/voices/2014/05/two-thirds-us-are-uncomfortable-talking-disabled-people-we-need-time-money-and-effort> [Accessed 8 April 2020].

Ryan, F., 2018. *Hawking Won The World'S Respect – And Gave Disabled People Like Me Hope | Frances Ryan*. [online] the Guardian. Available at: <https://www.theguardian.com/commentisfree/2018/mar/14/hawking-respect-disabled-people-hope-scientist> [Accessed 20 May 2020].

Salman, S., 2019. *What Would A Truly Disabled-Accessible Smart City Look Like | Smart Cities Library™*. [online] Smart Cities Library™. Available at: <https://www.smartcitieslibrary.com/what-would-a-truly-disabled-accessible-smart-city-look-like/> [Accessed 19 May 2020].

SCHWAB, K. 2018. *The fourth industrial evolution* [Online]. Encyclopædia Britannica, inc. Available: https://www.britannica.com/topic/The-Fourth-Industrial-Revolution-2119734

SmartCity Press, 2019. What Should Be The Criteria For A Fully Accessible Smart City? Ask The Disabled!. Available at: <https://www.smartcity.press/challenges-faced-by-disabled-people/> [Accessed 18 May 2020].

Smith, S., 2010. *Social Obstacles Are The Real Problem For Disabled People | SE Smith*. [online] the Guardian. Available at: <https://www.theguardian.com/commentisfree/2010/sep/19/disability-social-obstacles-real-problem> [Accessed 20 May 2020].

Spauldingrehab.org. 2020. *Council On Disability Awareness - Disability Advocacy Group*. [online] Available at: <https://spauldingrehab.org/about/advocacy/council-disability-awareness> [Accessed 28 July 2020].

Spauldingrehab.org. n.d. *Assistive Technology - Spaulding Rehab*. [online] Available at: <https://spauldingrehab.org/conditions-services/assistive-technology> [Accessed 28 July 2020].

Spauldingrehab.org. n.d. *Innovation And Technology | Spaulding Rehab*. [online] Available at: <https://spauldingrehab.org/giving/priorities/innovation-technology> [Accessed 28 July 2020].

Sullins, E., 2019. *Challenges Facing Young Adults With Disabilities | HCBS | Home Community Based Services*. [online] HCBS | Home Community Based Services. Available at: <https://hcbsprovider.com/challenges-facing-young-adults-with-disabilities/> [Accessed 20 May 2020].

Teach.com. 2017. *Incorporating The Five Senses To Stimulate Learning - Blog*. [online] Available at: <https://teach.com/blog/incorporating-the-five-senses-to-stimulate-learning/> [Accessed 9 April 2020].

US Department of Veterans Affairs, V., 2020. *VA.Gov | Veterans Affairs*. [online] Paloalto.va.gov. Available at: <https://www.paloalto.va.gov/about/history.asp> [Accessed 10 July 2020].

Van Rhee, P., 2019. *E-Sports: A True Phenomenon Of Globalization*. [online] Diggit Magazine. Available at: <https://www.diggitmagazine.com/articles/e-sports-globalization> [Accessed 11 Feb 2020].

Thesis

Berg, E., 2014. *The Study Of Senses And The Impact On The Built Environment: A Proposed Rehabilitation Center For The Visually Impaired*. Masters. University of Kwa-Zulu Natal.

Dischinger, M., 2000. *Designing For All Senses Accessible Spaces For Visually Impaired Citizens*. Ph.D. Chalmers University of technology.

Hanif Bin Masridin, M., 2019. *Healing Architecture For Mobility Impaired Through Therapeutic Design*. Masters. Universiti Teknologi Malaysia.

Holz, H., 2011. *Sensory Architecture Redefining How One Interprets Space*. Masters. North Dakota State University.

Jinnah, A., 2018. *EXPLORING HOW THE HEALING AND REINTEGRATION OF THE PHYSICALLY DISABLED INFORMS ARCHITECTURAL DESIGN: Towards A Rehabilitation And Special Care Centre In The City Of Durban*. Masters. University of KwaZulu-Natal.

Ndaba, S., 2003. *An Application Of 'Universal Design' As A Practical Approach 'Disability Policy' In South Africa: Towards Planning That Meets The Needs Of All Residents: Case Of Umlazi-Durban*. Masters. University of Natal.

Osei, Y., 2014. *Exploring Sensory Design In Therapeutic Architecture*. Masters. Carleton University.

Vermeersch, P., 2013. *Less Vision, Mores Senses Towards A More Multisensory Design Approach In Architecture*. Ph.D. Catholic university of Leuven.

wong, H., 2014. *ARCHITECTURE WITHOUT BARRIERS: Designing Inclusive Environments Accessible To All*. Masters. Ryerson University.

Journals

Bandura, A., 2000. Exercise of Human Agency Through Collective Efficacy. *Current Directions in Psychological Science*, 9(3), pp.75-78.

Corrêa Cavalieri, I. and Neves Almeida, H., 2018. Power, Empowerment and Social Participation- the Building of a Conceptual Model. *European Journal of Social Science Education and Research*, 5(1), pp.174-185.

Dolmage, J., 2015. Universal Design: Places to Start. *Disability studies quarterly the first journal in the field of disability studies* 35(2).

Friedman, T., 1999. DOScapital. *Foreign Policy*, [online] pp.110-116.

LaMendola, B. (1998, April 12). Age-old question: How long can we live? The Denver Post

Mann, W., 2001. The Potential of Technology to Ease the Care Provider's Burden. 25.

Marschall, S., 1998. *ARCHITECTURE AS EMPOWERMENT: THE PARTICIPATORY APPROACH IN CONTEMPORARY ARCHITECTURE IN SOUTH AFRICA*. [online] Transformationjournal.org.za. Available at: <http://transformationjournal.org.za/wp-content/uploads/2017/03/trans035005.pdf> [Accessed 24 March 2020].

Pereira, L., Karpouzoglou, T., Frantzeskaki, N. and Olsson, P., 2018. Designing transformative spaces for sustainability in social-ecological systems. *Ecology and Society*, [online] (4)

Perkins, D. and Zimmerman, M., 1995. Empowerment theory, research, and application. *American Journal of Community Psychology*, 23(5), pp.569-579.

Philbeck, T. and Davis, N., 2018. THE FOURTH INDUSTRIAL REVOLUTION: SHAPING A NEW ERA. *Journal of International Affairs*, [online] 72. Available at: <https://www.jstor.org/stable/26588339>

Pigg, K., 2002. Three Faces of Empowerment: Expanding the Theory of Empowerment in Community Development. Journal of the Community Development Society, 33(1), pp.107-123.

STRIKWERDA, C. 2000. From World-Systems to Globalization: Theories of Transnational Change and the Place of the United States. *American Studies*, 41**,** 333-348.

THE JOURNAL OF THE AMERICAN INSTITUTE OF ARCHITECTS, 2019. The U.S. Department of Veterans Affairs Palo Alto. [online] Available at: <https://www.architectmagazine.com/project-gallery/the-u-s-department-of-veterans-affairs-palo-alto-vapa-polytrauma-and-blind-rehabilitation-center_o> [Accessed 10 July 2020].

Newspaper

Witt, J., 1991. The Role of Technology in Removing Barriers. *The Milbank Quarterly*, 69, p.313.

Conference proceeding

Herssens, J., 2013. Design(ing) for more – towards a global design approach and local methods. Asia: Hasselt University, Hasselt, Belgium.

Schwarb, K., 2016. The fourth industrial revolution. In: *World economic forum*.

Videos

Kalodikis, C., 2019. *Social & Ethical Issues: Globalisation*. [video] Available at: <https://www.youtube.com/watch?v=8qN7Fty19Cc&t=7s> [Accessed 11 Feb 2020].

Stephen Hawkings, video message for the UNESCO New Delhi Conference 2014 (English subtitles. 2016. [video] Directed by S. Hawking. New Delhi, India: UNESCO.

TEDxColombo, 2018. *Can Architecture Build People's Lives?*. [video] Available at: <https://www.youtube.com/watch?v=Bsh763_pZkc> [Accessed 11 Feb 2020].

TEDxMidAtlantic, 2014. *Why I'm An Architect That Designs For Social Impact, Not Buildings*. [video] Available at: <https://www.youtube.com/watch?v=x0MnGZ1gB4k> [Accessed 11 Feb 2020].

APPENDIX 2

APPENDIX 1

MANAGEMENT

1. What influenced the creation of this establishment?

The need for support to the physically disabled community.

2. How long has this institution been in operation?

68 years.

3. How many facilities do you'll have and how big are they?

One facility for Remedial Therapy & Ward centre

4. How any members does your institute cater for?

91 permant employees & ± 40 for Remedial Therapy centre

5. What age groups are accommodated for in your facility?

Over 18+

6. What programmes do you'll have for volunteers at your organisation? Provide a brief description.

Volunteers are able to work with the physically disable staff in the work centre to assist with difficult jobs. Volunteers are welcome at the organisation.

7. What activities or programs (social, health, educational) are encouraged to improve the fitness and well-being of the occupants?

Remedial therapy Centre - assist in mobilization of joints, muscle and overall health of people.
Educational - trainings provided on aids, TB and other diseases

8. What activities or programs (social, health, educational) do you'll have in place to create awareness about disability?

Social workers do visit. Awaness talks by other disabled people.

9. Does your facility encourage social integration between the public and the occupants? If so, How?

Yes, though volunteer and social workers doing their practicals for Social Degree.

10. Have you considered programmes of training that would assist the individuals with skills in context of the 21st century?

NO

11. How many of the individuals at the facility are technologically inclined?

Mobile phone only. None computer literate

12. Do they have access to smartphones, laptops and the internet? (state yes or no)

Yes, smartphones some do poccss laptops

13. For those that don't have access to smart phones and computers, Are they capable of utilizing such devices? (state yes or no)

No.

14. Which is the majority, Technologically literate individuals or technologically illiterate individuals?

Blacd females wth disabilities.

15. How does your facility generate income?

- Wood centre production
- Donor funds
- Bequeats
- Genral fun raising.

16. Are there any challenges that the staff encounter in taking care of these individuals with disabilities? If so, what are these challenges?

→ Some people at RTC → not accepting their disability and fighting with care givers
- Workers on W.C not understanding business principles such as income, running costs & wage allowances

17. Is there any further information or comments that you could provide that would benefit this research?

Social & educational interaction with the labour on the W.C is difficult at times due to intellect & upbringing. Not many have more than a Grade 8 education.
Many support households even though they are disabled.

MANAGEMENT

1. What influenced the creation of this establishment?

Compassion
A need to provide support for children and young adults.

2. How long has this institution been in operation?

25 YEARS

3. How many facilities do you'll have and how big are they?

Two Facilities. Pathways 1-3 Baden Road and Pathways Enterprises, No, 841 Josiah Gumede Road.

4. How any members does your institute cater for?

many
76

5. What age groups are accommodated for in your facility?

Cerebal Palsy, Autism

6. What programmes do you'll have for volunteers at your organisation? Provide a brief description.

Volunteers fit into the routines and curriculum of the Pathways

7. What activities or programs (social, health, educational) are encouraged to improve the fitness and well-being of the occupants?

Physio, Swimming, Ball skills

8. What activities or programs (social, health, educational) do you'll have in place to create awareness about disability?

Website

9. Does your facility encourage social integration between the public and the occupants? If so, How?

Yes. - Public are invited to visit.

10. Have you considered programmes of training that would assist the individuals with skills in context of the 21st century?

Renewable energy course ie. Wind Turbines

11. How many of the individuals at the facility are technologically inclined?

10%

12. Do they have access to smartphones, laptops and the internet? (state yes or no)

Yes

13. For those that don't have access to smart phones and computers, Are they capable of utilizing such devices? (state yes or no)

Yes

14. Which is the majority, Technologically literate individuals or technologically illiterate individuals?

Technologically Illiterate

15. How does your facility generate income?

School Fees, Fund Raising, Private donors Donations.

16. Are there any challenges that the staff encounter in taking care of these individuals with disabilities? If so, what are these challenges?

Emotional, Mental, physical, sensory.

17. Is there any further information or comments that you could provide that would benefit this research?

Pathways and similar ~~[illegible]~~ institutions require more funding from Government.

MANAGEMENT

1. What influenced the creation of this establishment?

The fact that parents travel many miles to and from different places in order to get the best therapy and help for their children.

2. How long has this institution been in operation?

25 years

3. How many facilities do you'll have and how big are they?

There are 5 Pathways in SA.
They serve between 20 and 70 families as well as some outlying communities

4. How any members does your institute cater for?

76 children and young adults on a daily basis.

5. What age groups are accommodated for in your facility?

3 years to 30 years.

6. What programmes do you'll have for volunteers at your organisation? Provide a brief description.

Volunteers slot into the programmes run at the centre

7. What activities or programs (social, health, educational) are encouraged to improve the fitness and well-being of the occupants?

Physiotherapy, swimming, ball skills, outside play.

8. What activities or programs (social, health, educational) do you'll have in place to create awareness about disability?

Website
Social stories for the children
Interaction into local schools.

9. Does your facility encourage social integration between the public and the occupants? If so, How?

Yes. People are encouraged to visit. Are invited to our annual Sports Day and Christmas play.

10. Have you considered programmes of training that would assist the individuals with skills in context of the 21st century?

Recycling projects,

11. How many of the individuals at the facility are technologically inclined?

10%

12. Do they have access to smartphones, laptops and the internet? (state yes or no)

A few do.

13. For those that don't have access to smart phones and computers, Are they capable of utilizing such devices? (state yes or no)

Yes

14. Which is the majority, Technologically literate individuals or technologically illiterate individuals?

Technologically illiterate

15. How does your facility generate income?

Fees from parents
Fundraising
Donors

16. Are there any challenges that the staff encounter in taking care of these individuals with disabilities? If so, what are these challenges?

There are many challenges as all the children and young adults have severe disabilities which impact on their everyday life.

17. Is there any further information or comments that you could provide that would benefit this research?

Centres such as Pathways need to recognised by Govt and assisted financially as well as with the many resources needed to train both children and young people with disabilities as well as caregivers and facilitators in ways to teach skills.

APPENDIX 2

STAFF OR CAREGIVER

1. What is your relationship with the individual?

Supervisor

2. How old was HE/SHE when they joined the organisation?

45 years

3. What was the reason or cause for the individual to join the facility?

Being unemployed and needed money to support family.

4. Is the individual socially disconnected due to their impairment?

No

5. Is the individual comfortable with their impairment or do they prefer to remain in isolation?

Very comfortable

6. Is there any activity of preference that you feel would make a difference in helping the individual feel more comfortable and more connected with their daily lives? If so please elaborate.

Be able to do what he wishes without being disabled.

7. Are any of the current activities that they partake in beneficial to them?

Music and singing in choir.

8. Does the individual show interest in any form of technology such as 3D printing, gaming, drones or computers?

yes

9. Does the individual have access to technology such as smartphones, computers and the internet?

yes currently having a smart phone

10. Does the individual participate in electronic gaming (game station, cell phone, computer)?

yes

11. Has the individual ever mentioned a place of visitation or preference or scenery that they would like to experience?

Visiting the farm on his spare time

12. As a staff member or caregiver, do you think more people need to be educated about the physically impaired population?

yes

13. If so, how would you educated the public about the physically impaired population?

Being able to communicate with and give the hope with their disability.

14. As a staff/caregiver are there any spaces you feel will be beneficial in assisting this particular individual?

yes, communicate with the individual and unde

15. Would you consider being trained with skills that are trending in today's generation and then passing your knowledge to the individuals with impairments(skills such as, a social media influencer, prosthetics, recreational and educational activities dealing with the advancement in the technological field, digital art etc?

yes, to get skills of today's generation.

16. As a staff member/ caregiver, what challenges do you face when providing support for this particular individual and how do you think it should be addressed?

Some pet people are so difficult to approach because of their mentality and some being slow learners.

17. Is there any further information or comments that you could provide that would benefit this research?

To communicate with each and individual and get to understand their feelings and their needs and have a better understanding of their difficulties on a day to day basis.

STAFF OR CAREGIVER

1. What is your relationship with the individual?

HEAD OF DEPARTMENT

2. How old was ~~HE~~/SHE when they joined the organisation?

16 JANUARY ~~1991~~ 2001

3. What was the reason or cause for the individual to join the facility?

TO SUPPORT HERSELF AND 4 CHILDREN AFTER HER HUSBAND PASSED ON

4. Is the individual socially disconnected due to their impairment?

No

5. Is the individual comfortable with their impairment or do they prefer to remain in isolation?

YES

6. Is there any activity of preference that you feel would make a difference in helping the individual feel more comfortable and more connected with their daily lives? If so please elaborate.

SOME PHYSICAL ACTIVITY JOINING A GYM

7. Are any of the current activities that they partake in beneficial to them?

YES - EMPLOYMENT FOR SUSTAINABILITY

8. Does the individual show interest in any form of technology such as 3D printing, gaming, drones or computers?

YES - GAMING

9. Does the individual have access to technology such as smartphones, computers and the internet?

YES - SMARTPHONE
YES - INTERNET

10. Does the individual participate in electronic gaming (game station, cell phone, computer)?

YES - CELL PHONE

11. Has the individual ever mentioned a place of visitation or preference or scenery that they would like to experience?

DUBAI & JOHANNESBURG & TO BOARD A PLANE

12. As a staff member or caregiver, do you think more people need to be educated about the physically impaired population?

YES

13. If so, how would you educated the public about the physically impaired population?

BE MORE CONSIDERATE TOWARDS PHYSICALLY IMPAIRED PEOPLE

14. As a staff/caregiver are there any spaces you feel will be beneficial in assisting this particular individual?

A COURSE IN LEARNING ENGLISH

15. Would you consider being trained with skills that are trending in today's generation and then passing your knowledge to the individuals with impairments(skills such as, a social media influencer, prosthetics, recreational and educational activities dealing with the advancement in the technological field, digital art etc?

YES

16. As a staff member/ caregiver, what challenges do you face when providing support for this particular individual and how do you think it should be addressed?

LANGUAGE BARRIER, NOT VERY FLUENT IN ENGLISH

17. Is there any further information or comments that you could provide that would benefit this research?

EASY ACCESS TO BUILDINGS - RAMPS, HANDRAILS
SPECIAL QUEUES IN SHOPS FOR PHYSICALLY IMPAIRED PEOPLE.
HIGHER EDUCATION AT A REDUCED RATE.
SPECIAL TARIFFS AT GYMS TO ENCOURAGE EXERCISES.

STAFF OR CAREGIVER

1. What is your relationship with the individual?

I am his facilitator.

2. How old was HE/SHE when they joined the organisation?

12yrs

3. What was the reason or cause for the individual to join the facility?

He joined the facility because of his condition. He has down syndrome.

4. Is the individual socially disconnected due to their impairment?

Not really, he enjoys communicating even though his speech is not good

5. Is the individual comfortable with their impairment or do they prefer to remain in isolation?

He seems quite comfortable.

6. Is there any activity of preference that you feel would make a difference in helping the individual feel more comfortable and more connected with their daily lives? If so please elaborate.

He likes socialising and meeting people. He likes adventures, that would help if the parents can offer him outdoor activities more often.

7. Are any of the current activities that they partake in beneficial to them?

Yes, he likes drawing his own pictures and exercise outdoors.

8. Does the individual show interest in any form of technology such as 3D printing, gaming, drones or computers?

Yes, he likes games on the all form of technology.

9. Does the individual have access to technology such as smartphones, computers and the internet?

Only computer games

10. Does the individual participate in electronic gaming (game station, cell phone, computer)?

Yes, computer games, playstation and cellphones

11. Has the individual ever mentioned a place of visitation or preference or scenery that they would like to experience?

Going to the beach, going out for shopping

12. As a staff member or caregiver, do you think more people need to be educated about the physically impaired population?

Yes, that would be beneficial to them in dealing and helping people with impairments.

13. If so, how would you educated the public about the physically impaired population?

I would make them understand people with impairments, help them and taking care of them

14. As a staff/caregiver are there any spaces you feel will be beneficial in assisting this particular individual?

15. Would you consider being trained with skills that are trending in today's generation and then passing your knowledge to the individuals with impairments(skills such as, a social media influencer, prosthetics, recreational and educational activities dealing with the advancement in the technological field, digital art etc?

Yes, it would be A benefit to individuals around me and also to myself.

16. As a staff member/ caregiver, what challenges do you face when providing support for this particular individual and how do you think it should be addressed?

Challenges like behavior and puberty are the most common. They have to be taught about puberty stage and understand their feelings. Parents can also take part in helping them deal with it at home.

17. Is there any further information or comments that you could provide that would benefit this research?

I believe that staff and parents should communicate and work together in helping them understand and be able to deal with their impairments. Together we can help them be better individuals in future.

STAFF OR CAREGIVER

1. What is your relationship with the individual?

Caregiver

2. How old was HE/SHE when they joined the organisation?

She was 5 years old.

3. What was the reason or cause for the individual to join the facility?

Stimulation and to be taught more on how to use different communication devices to communicate.

4. Is the individual socially disconnected due to their impairment?

Not really

5. Is the individual comfortable with their impairment or do they prefer to remain in isolation?

Yes, ~~He~~ She is comfortable

6. Is there any activity of preference that you feel would make a difference in helping the individual feel more comfortable and more connected with their daily lives? If so please elaborate.

The child has severe disability but I think if she can have a special switch game whereby she can try to use it without any help.

7. Are any of the current activities that they partake in beneficial to them?

Yes

8. Does the individual show interest in any form of technology such as 3D printing, gaming, drones or computers?

Yes

9. Does the individual have access to technology such as smartphones, computers and the internet?

NO

10. Does the individual participate in electronic gaming (game station, cell phone, computer)?

NO

11. Has the individual ever mentioned a place of visitation or preference or scenery that they would like to experience?

NO, but at the centre She does ask to see Some of her friends

12. As a staff member or caregiver, do you think more people need to be educated about the physically impaired population?

Yes

13. If so, how would you educated the public about the physically impaired population?

Let them know that even if a person is physicaly impaired, they can have the ability to do something and they have the right to go school, allow them to do some things on their own, not just stay at home.

14. As a staff/caregiver are there any spaces you feel will be beneficial in assisting this particular individual?

Yes

15. Would you consider being trained with skills that are trending in today's generation and then passing your knowledge to the individuals with impairments(skills such as, a social media influencer, prosthetics, recreational and educational activities dealing with the advancement in the technological field, digital art etc?

Yes, if given opportunity

16. As a staff member/ caregiver, what challenges do you face when providing support for this particular individual and how do you think it should be addressed?

There are lot of challenges as she is battling to do thing at her own. A lot need to be done e.g. to have a special chair designed for her.

17. Is there any further information or comments that you could provide that would benefit this research?

If the goverment can give support to the centres for children with disability and provide some wheel chairs for those inneed. Give the school resources they need.

STAFF OR CAREGIVER

1. What is your relationship with the individual?

I am the facilitator, I assist the individual during the Classroom.

2. How old was HE/SHE when they joined the organisation?

They joined organisation at age 5 years

3. What was the reason or cause for the individual to join the facility?

The individual has physical disabilities

4. Is the individual socially disconnected due to their impairment?

Not really

5. Is the individual comfortable with their impairment or do they prefer to remain in isolation?

They are Comfortable, as they like to Socialize

6. Is there any activity of preference that you feel would make a difference in helping the individual feel more comfortable and more connected with their daily lives? If so please elaborate.

The participation of every activities, such as having Choices in everything that is life skills

7. Are any of the current activities that they partake in beneficial to them?

Yes

8. Does the individual show interest in any form of technology such as 3D printing, gaming, drones or computers?

Yes they does, as much as they dont have device but they show interest, from one who has in the classroom. in also on gaming they like to participate.

9. Does the individual have access to technology such as smartphones, computers and the internet?

AT the moment they exposed to these devices

10. Does the individual participate in electronic gaming (game station, cell phone, computer)?

Yes, they does have access at home

11. Has the individual ever mentioned a place of visitation or preference or scenery that they would like to experience?

They do say if they want to change place/Plays with some.

12. As a staff member or caregiver, do you think more people need to be educated about the physically impaired population?

Yes

13. If so, how would you educated the public about the physically impaired population?

It is important for people to know, that People With physical impaired has abilities and rights to be involved in public activities in order to do that, We Can organise awareness campaigns. to workshop people

14. As a staff/caregiver are there any spaces you feel will be beneficial in assisting this particular individual?

Yes

15. Would you consider being trained with skills that are trending in today's generation and then passing your knowledge to the individuals with impairments(skills such as, a social media influencer, prosthetics, recreational and educational activities dealing with the advancement in the technological field, digital art etc?

Yes, If I Can get an opportunity

16. As a staff member/ caregiver, what challenges do you face when providing support for this particular individual and how do you think it should be addressed?

There are challenges, if the individual. Cannot Cope With communication and. When they not feeling Comfortable With New people around them. The Social Stories Can help, and people Should Not Show Sympath on them.

17. Is there any further information or comments that you could provide that would benefit this research?

If Gouernment Can intervene on. these facilites. and offers more. resources

STAFF OR CAREGIVER

1. What is your relationship with the individual?

I have a very good relationship with him. I understand him as he's teacher/facilitat

2. How old was HE/SHE when they joined the organisation?

14

3. What was the reason or cause for the individual to join the facility?

He came to Pathways because we cater for older children.

4. Is the individual socially disconnected due to their impairment?

I would say yes he need to get more interactive

5. Is the individual comfortable with their impairment or do they prefer to remain in isolation?

He looks quite comfortable with his impairment.

6. Is there any activity of preference that you feel would make a difference in helping the individual feel more comfortable and more connected with their daily lives? If so please elaborate.

He is smart and I believe that he still need more help in socialising and meeting people. e.g. going out with friends, to the movies etc.

7. Are any of the current activities that they partake in beneficial to them?

Yes they are able to write their names and also benefit from puzzles because they get to match pieces

8. Does the individual show interest in any form of technology such as 3D printing, gaming, drones or computers?

We have a computer lesson where He plays games and he enjoys the different sounds in different games.

9. Does the individual have access to technology such as smartphones, computers and the internet?

Only computer games.

10. Does the individual participate in electronic gaming (game station, cell phone, computer)?

Computer games.

11. Has the individual ever mentioned a place of visitation or preference or scenery that they would like to experience?

He likes to go out with family to the beach and park

12. As a staff member or caregiver, do you think more people need to be educated about the physically impaired population?

Yes, I think would help them deal with their impairm

13. If so, how would you educated the public about the physically impaired population?

Treating others the same as you, and respecting other peoples ideas, Be able to take turns.

14. As a staff/caregiver are there any spaces you feel will be beneficial in assisting this particular individual?

15. Would you consider being trained with skills that are trending in today's generation and then passing your knowledge to the individuals with impairments(skills such as, a social media influencer, prosthetics, recreational and educational activities dealing with the advancement in the technological field, digital art etc?

Yes, that would be a great achievement for me and individuals around me.

16. As a staff member/ caregiver, what challenges do you face when providing support for this particular individual and how do you think it should be addressed?

We face many challenges, like behavior and turn taking is the common issue to most individuals. Parents need to help us with these at home. Puberty is another challenge we come across.

17. Is there any further information or comments that you could provide that would benefit this research?

I believe that staff and parents should communicate and work together in helping them understand and be able to deal with their impairments. Together we can help them be better individuals in future.

STAFF OR CAREGIVER

1. What is your relationship with the individual?

I Am a Facilitator

2. How old was HE/SHE when they joined the organisation?

He was 4 years old

3. What was the reason or cause for the individual to join the facility?

He has down Syndrome

4. Is the individual socially disconnected due to their impairment?

NO

5. Is the individual comfortable with their impairment or do they prefer to remain in isolation?

He doesn't show any kind of discomfortable

6. Is there any activity of preference that you feel would make a difference in helping the individual feel more comfortable and more connected with their daily lives? If so please elaborate.

Yes there ~~is~~ are, Ever Since his arrival at this ~~Some activities for him prepared~~ facility, he has been doing daily Social activities like preparing his own food and for other kids, going to the toilet on his own and packing away every time after each activity. These activities helps him to gain confident and live his daily life as a normal person.

7. Are any of the current activities that they partake in beneficial to them?

yes. activities like physical exercises improves their gross motor.

8. Does the individual show interest in any form of technology such as 3D printing, gaming, drones or computers?

He shows interest in Ipads, every monday he has a lesson of 1hour where He play with an Ipad that has games installed.

9. Does the individual have access to technology such as smartphones, computers and the internet?

The Ipads he uses does not have access to internet but has activities of Numeracy and literacy.

10. Does the individual participate in electronic gaming (game station, cell phone, computer)?

He participate in Ipads.

11. Has the individual ever mentioned a place of visitation or preference or scenery that they would like to experience?

He Sometimes fantisize about meeting his favourite Superhe

12. As a staff member or caregiver, do you think more people need to be educated about the physically impaired population?

yes I think they certanly do.

13. If so, how would you educated the public about the physically impaired population?

Organise awareness events about disability.

14. As a staff/caregiver are there any spaces you feel will be beneficial in assisting this particular individual?

15. Would you consider being trained with skills that are trending in today's generation and then passing your knowledge to the individuals with impairments(skills such as, a social media influencer, prosthetics, recreational and educational activities dealing with the advancement in the technological field, digital art etc?

Yes I would like to be trained. Such Skills are important to the Individuals with impairments ~~because~~ In order for them to feel comfortable with present lifeStyle.

16. As a staff member/ caregiver, what challenges do you face when providing support for this particular individual and how do you think it should be addressed?

NO

17. Is there any further information or comments that you could provide that would benefit this research?

I Think as we Staff we could communicate with Parents to work in help Children to be able to understand what ~~its~~ is needed to be independent.

STAFF OR CAREGIVER

1. What is your relationship with the individual?

I am a facilitator, I help the individual among the Classroom.

2. How old was HE/SHE when they joined the organisation?

5yrs.

3. What was the reason or cause for the individual to join the facility?

The individual has physical disabilities

4. Is the individual socially disconnected due to their impairment?

Not really

5. Is the individual comfortable with their impairment or do they prefer to remain in isolation?

They don't show anykind of discomfortable.

6. Is there any activity of preference that you feel would make a difference in helping the individual feel more comfortable and more connected with their daily lives? If so please elaborate.

Yes, since they arive in this facility they been doing daily activities, like EXCirsizes and stand on standing frame.

7. Are any of the current activities that they partake in beneficial to them?

Yes

8. Does the individual show interest in any form of technology such as 3D printing, gaming, drones or computers?

Yes, Because in able to communicate they use Computer that is featured With Special AAC Symbols.

9. Does the individual have access to technology such as smartphones, computers and the internet?

Yes they do.

10. Does the individual participate in electronic gaming (game station, cell phone, computer)?

Yes they do, but not really exposed on cell phone.

11. Has the individual ever mentioned a place of visitation or preference or scenery that they would like to experience?

They are Sometime fantasize about making new Friend where they meet with new people

12. As a staff member or caregiver, do you think more people need to be educated about the physically impaired population?

Yes, People need to be aware of their conditions and how to treat situation when they meet

13. If so, how would you educated the public about the physically impaired population?

As it is important for people to know, that people with physical impaired has abilities and rights to be involved in public ~~Fctivities~~ activities, in order to do that, We can organise awareness Compaigns. to workshop people

14. As a staff/caregiver are there any spaces you feel will be beneficial in assisting this particular individual?

Yes

15. Would you consider being trained with skills that are trending in today's generation and then passing your knowledge to the individuals with impairments(skills such as, a social media influencer, prosthetics, recreational and educational activities dealing with the advancement in the technological field, digital art etc?

Yes, if I can get an opportunity

16. As a staff member/ caregiver, what challenges do you face when providing support for this particular individual and how do you think it should be addressed?

There are challenges whereby I am unable to figure out, what they need help for, unable to communicate. With them to found out if are there any problem they have at that moment. The Social Stories can help

17. Is there any further information or comments that you could provide that would benefit this research?

If the government can intervene on the facilities and more. more resources.

STAFF OR CAREGIVER

1. What is your relationship with the individual?

SUPERVISOR

2. How old was HE/SHE when they joined the organisation?

35 YRS

3. What was the reason or cause for the individual to join the facility?

LOOKING FOR A JOB TO ASSIST IN FINANCIAL NEEDS.

4. Is the individual socially disconnected due to their impairment?

NO.

5. Is the individual comfortable with their impairment or do they prefer to remain in isolation?

YES, INDIVIDUAL IS COMFORTABLE

6. Is there any activity of preference that you feel would make a difference in helping the individual feel more comfortable and more connected with their daily lives? If so please elaborate.

GETTING THE INDIVIDUAL TO USE SOCIAL PLATFORMS TO GET MORE CONNECTED WITH PEOPLE AROUND THE WORLD.

7. Are any of the current activities that they partake in beneficial to them?

YES, AS IT ASSISTS IN AIDING THEM TO BALANCE THEIR FINANCIAL NEEDS.

8. Does the individual show interest in any form of technology such as 3D printing, gaming, drones or computers?

YES, IN COMPUTERS.

9. Does the individual have access to technology such as smartphones, computers and the internet?

YES, THE INDIVIDUAL HAS ACCESS TO A SMART PHONE

10. Does the individual participate in electronic gaming (game station, cell phone, computer)?

NO.

11. Has the individual ever mentioned a place of visitation or preference or scenery that they would like to experience?

YES, GOING TO THE FARM.

12. As a staff member or caregiver, do you think more people need to be educated about the physically impaired population?

YES.

13. If so, how would you educated the public about the physically impaired population?

THROUGH WORD OF MOUTH & VIA SOCIAL PLATFORM OR INTERNET

14. As a staff/caregiver are there any spaces you feel will be beneficial in assisting this particular individual?

YES, ASSISTING THE INDIVIDUAL IN WHAT HE WANTS TO DO.

15. Would you consider being trained with skills that are trending in today's generation and then passing your knowledge to the individuals with impairments(skills such as, a social media influencer, prosthetics, recreational and educational activities dealing with the advancement in the technological field, digital art etc?

NO, AS I GET INFORMATION VIA INTERNET TO BUILD EXPERIENCE TO PASS ON KNOWLEDGE

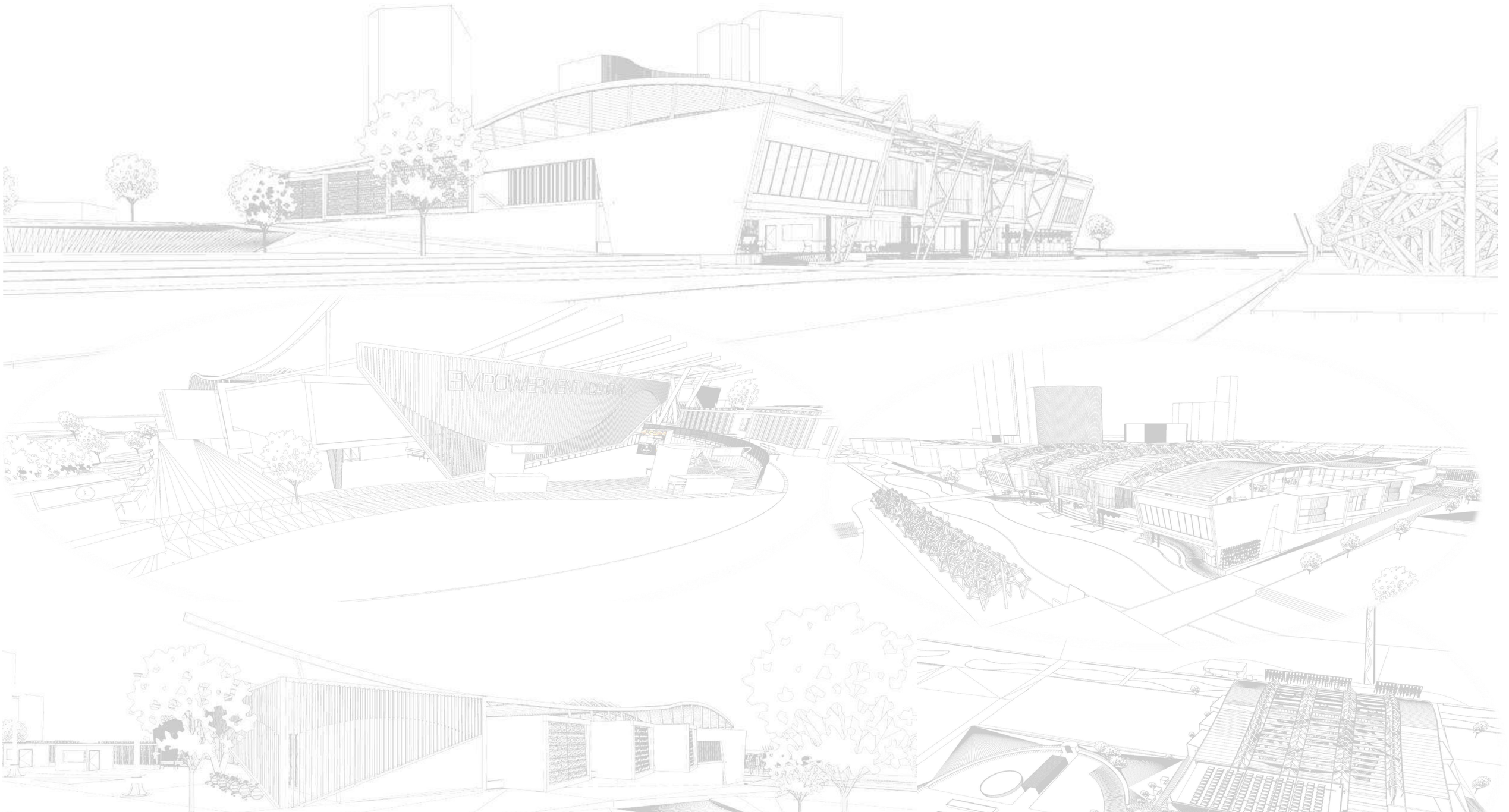
16. As a staff member/ caregiver, what challenges do you face when providing support for this particular individual and how do you think it should be addressed?

THE CHALLENGE I FACE WITH THE INDIVIDUAL IS THEIR UNDERSTANDING. IT SHOULD BE ADDRESSED IN THEIR LANGUAGE SO THAT IT MAY HELP THE INDIVIDUAL UNDERSTAND.

17. Is there any further information or comments that you could provide that would benefit this research?

NO.

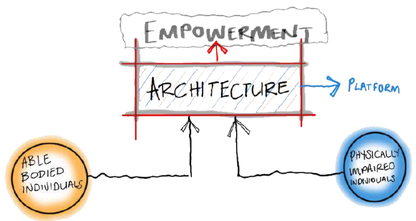
THE INFLUENCE OF 21 ST CENTURY TECHNOLOGY FOR THE PHYSICALLY IMPAIRED IN THE BUILT FORM



PROBLEM



AMALGAMATION



"ITS NOT OUR DISABILITIES, ITS OUR ABILITIES THAT COUNT"
-CHRIS BURKE

A PROPOSED EMPOWERMENT ACADEMY

COVER

KRISHEN SINGH-
213504966

THE INFLUENCE OF 21 ST CENTURY TECHNOLOGY FOR THE PHYSICALLY IMPAIRED IN THE BUILT FORM

RESEARCH OVERVIEW

TRANSITION INTO ADULTHOOD IS CHALLENGING FOR INDIVIDUALS WITH PHYSICAL IMPAIRMENTS

LACK OF A NURTURING ENVIRONMENT TO EQUIP INDIVIDUALS WITH SKILLS THEY NEED TO GET BY DAILY

THE INFLUENCE OF 21 ST CENTURY TECHNOLOGY FOR THE PHYSICALLY IMPAIRED IN THE BUILT FOR: A PROPOSED EMPOWERMENT ACADEMY

- INTRODUCTION
- PROBLEM
  - DISCONNECTED FROM SOCIETY DUE TO STIGMA
- MOTIVATION
  - SOCIAL COHESION
  - CREATING OPPORTUNITIES
  - CREATING AWARENESS
- AIM
  - HOW THE BUILT ENVIRONMENT CAN BE ADAPTED FOR THE USE OF 21 ST CENTURY TECHNOLOGY TO ASSIST THE PHYSICALLY IMPAIRED IN THIS TRANSITION

EMPOWERMENT ACADEMY

- SOCIAL PLATFORM TO HELP DISABLED PEOPLE BECOME APART OF THE COMMUNITY, BE MORE INDEPENDENT
- SKILLS DEVELOPMENT
- CREATES AWARENESS OF DISABILITY
- GUIDANCE WITH 21 ST CENT TECH(PROSTHETIC PRINTING AND TRAINING
- LEISURE AND RECREATIONAL FACILITY FOR ABLE-BODIED AND INDIVIDUALS WITH PHYSICAL IMPAIRMENTS

PROBLEM STATMENT

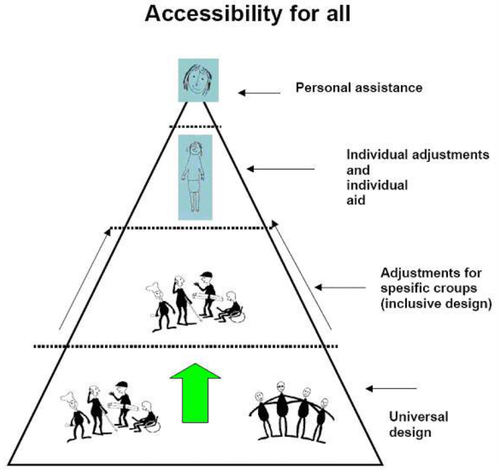
transitioning into adulthood is a difficult time for any individual. this is a very crucial time for them because the decisions they make can have a lasting effect of their future. this transition is particularly difficult for individuals with physical impairments, especially those that are not equipped with skills to get by daily life

OBJECTIVES

1. To determine how the built environment can be adapted in the 21 st century to assist the physically impaired in their transition into adulthood?
2. To determine the spatial requirements for the physically impaired to develop skillsets for the 21 st century?
3. to understand what effects the role of globalization and technology have on the built environment?
4. how can architecture and technology aid in creating inclusive environment?

SYNTHESIS OF THEORY

THEORY OF UNIVERSAL DESIGN



- HOLISTIC AND INNOVATIVE APPROACH
- UNIVERSAL DESIGN IS ABOUT BUILDING HOLISTIC INCLUSIVE COMMUNITIES

EMPOWERMENT THEORY

LITERATURE REVIEW

UNDERSTAND YOUR RELATIONSHIP WITH THE SOCIAL SITUATION

1.SELF-EFFICACY

2. CRITICAL CONSCIOUSNESS

BE UNBIASED AND UNDERSTAND THE DYNAMICS OF PHYSCAL IMPAIRMENTS FROM ALL PERSPECTIVES

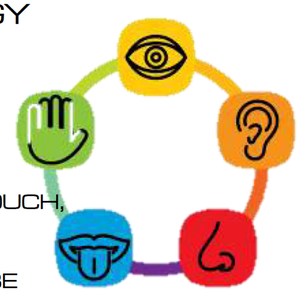
DESIGN

3.STRATEGIES

DISABILITY SHOULD NOT BE TUCKED AWAY, BUT OUT IN THE OPEN, CREATE AWARENESS AND INTEGRATED WITH THE GENERAL PUBLIC

PHENOMENOLOGY

MULTISENSORY DESIGN



- **HAPTICITY**- IS UNLIKE STIMULATING TOUCH, WHICH IS 2 DIMENSIONAL. HAPTICITY IS 3 DIMENSIONAL. AND REQUIRES THE ENVIRONMENT TO BE EXPLORED.
- **-KINAESTHESIA** COMBINES SENSES AND INDIVIDUAL EXPERIENCE . THE VISUAL WITH EXPLORATION MOVEMENT
- **SYNAESTHESIA**- IS BLURRING THE LINES BETWEEN SENSE AND ALLOWS FOR OVERLAPPING

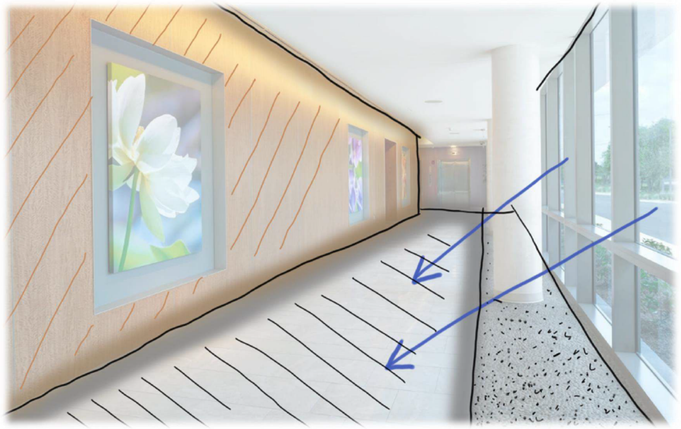
KRISHEN SINGH-213504966

PRECEDENT AND CASESTUDY

PALO ALTO POLYTRAUMA AND BLIND REHAB CENTER

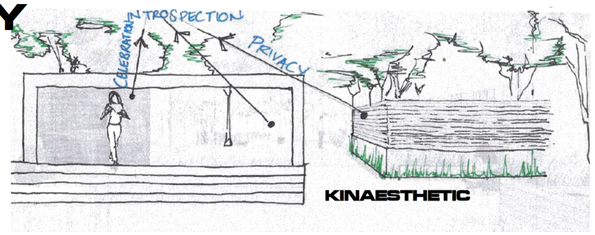
PEOPLE THAT RECENTLY LOST THEIR SIGHT ARE TRAINED TO NAVIGATE THOUGH THEIR ENVIRONMENT

BUILDING HAS MULTIPLE FUNCTIONS TO ASSIST INDIVIDUALS WITH DISABIILITIES.

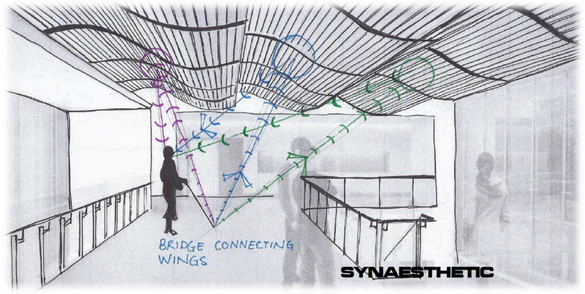


BUILDING PROVIDES A HOME LIKE ENVIRONMENT AND CREATES A (NEIGHBOURHOOD) FEEL

MATERIAL, COLOR AND FURNITURE AID IN ENHANCING THE FEEL OF THE BUILDING



ON THE ROOF, A FOUNTAIN IS STRATEGICALLY PLACED TO INVITE THE USER TO EXPLORE....KINAESTHETIC EXPERIENCE



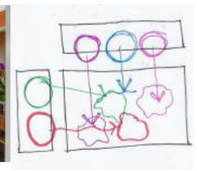
CEILINGS CUSTOM DESIGNED WITH ACOUSTIC VALUE SO THE SOUND SERVES AS A NOTIFICATION TO THE PATIENT AS TO WHERE THEY ARE

UTILIZES LIGHT IN A TACTILE WAYS. ALLOW LIGHT IN CERTAIN PARTS OF THE BUILDING FOR TEMPERATURE CHANGE MAKING THE PATIENTS STROLLS A SYNAESTHETIC ONE.

SPAULDING REHABILITATION HOSPITAL

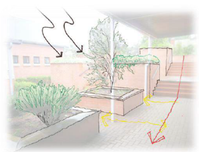
AIM IS TO IMPROVE THE PATIENTS LIVES WHEN THEY ARE IN THE HOSIPITAL AND WHEN THEY LEAVE.__EMPOWERMENT OF INDIVIDUALS WITH DISABILITIES



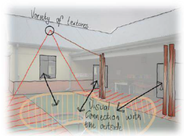


OVERLAPAPING SPACES. INTERIOR SPILLS OUT ONTO EXTERIOR

PATHWAYS SCHOOL







A WELCOMING VIEW FROM THE ENTRANCE THAT INCORPORATES NATURE

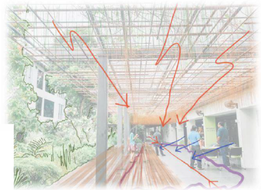
SPILL OUT SPACES THAT FEATURE A VARIETY OF TEXTURE FOR TACTILE EXPERIENCE, AND A VISUAL CONNECTION BETWEEN THE INTERIOR AND EXTERIOR SPACES

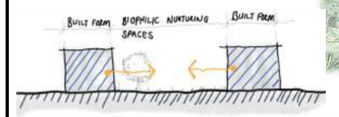
SUBTLE COLORS

ENABLING VILAGE: SINGAPORE

INCLUSIVE SPACE THAT INTEGRATES EDUCATION,WORK TRAINING REATAIL AND LIFESTYLE CONNECTING PEOPLE WITH DISABILITIES AND SOCIETY

BIOPHILIC DESIGN__NURTURING ENVIRONMENT INTERACTION ZONES





SAINT GILES NON-PROFIT ORGANISATION





WORK CENTER WHERE THE PHYSICALLY IMPAIRED AND ABLE-BODIED INDIVIDUALS WORK TOGETHER

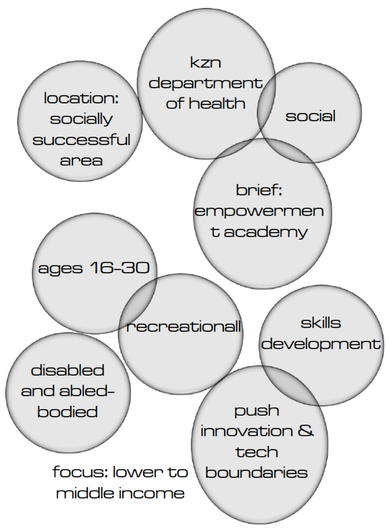
PROVIDES EMPLOYMENT FOR INDIVIDUALS WITH PHYSICAL IMPAIRMENT

NATURAL LIGHT FOR A MORE NATURALLY LIT ENVIRONMENT TO WORK IN

DESIGN DRIVERS

INCLUSIVITY | ACCESSIBILITY | HEALING ENVIRONMENT | SENSORY EXPERIENCE | INTERACTIVE

DESIGN BRIEF



CLIENT

women, youth & persons with disabilities
Department:
Women, Youth and Persons with Disabilities
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF WOMEN, CHILDREN AND PEOPLE WITH DISABILITIES

VISION_ A FULLY INCLUSIVE SOCIETY FREE FROM UNFAIR DISCRIMINATION, INEQUALITY, ABUSE AND EXPLOITATION.

MISSION_ TO DRIVE GOVERNMENTS EQUITY, EQUALLY AND EMPOWER PEOPLE WITH DISABILITY.

asiye etafuleni

NON-GOVERNMENT ORGANISATION

INCLUSIVE URBAN SPACES

RESEARCH LED DESIGN

ACCOMMODATION SCHEDULE

RECREATIONAL ACTIVITIES

- DRONES
- 3D PRINTING
- COMPUTER TRAINING
- TRAINING FOR JOBS SUCH AS MAPPING
- PROSTHETICS
- GAMING LANS
- DRONE RACING
- MAINTENANCE
- ESPORTS TRAINING
- MAINTENANCE
- ART
- WORK

EXHIBITION SPACES

- WORKSHOP
- GALLERY
- STORAGE
- DIGITAL ART MUSEUM

RESTAURANTS

- RESTAURANTS
- TAKE AWAY

RETAIL

- GADGETS
- COMIC BOOK STORE

THERAPY

- COUNCELLING
- PHYSIOTHERAPY

A PROPOSED EMPOWERMENT ACADEMY

DESIGN PRIMER

KRISHEN SINGH-
213504966

THE INFLUENCE OF 21 ST CENTURY TECHNOLOGY FOR THE PHYSICALLY IMPAIRED IN THE BUILT FORM

SITE SELECTION

SITE 1



The site is located behind howard college campus at 140 DALE ROAD, WESTRIDGE

PROS:
- FLANKED BY A DIVERSE DEMOGRAPHIC OF PEOPLE AND CULTURE.
- SPORTS FIELDS IN CLOSE PROXIMITY
- OPPORTUNITIES IN TERMS OF CREATING SOCIAL COHESION, NOT JUST WITH INDIVIDUALS WITH DISABILITIES BUT OF THE CURRENT SURROUNDING RESIDENTS AS WELL
- COLLABORATION WITH UNIVERSITY FOR RESEARCHING NEW TECHNOLOGY
- CLOSE TO OTHER FACILITIES THAT CATER FOR THE DISABLED

CONS:
- SECURITY IS AN ISSUE
- NO NIGHT LIFE, GETS VERY QUIET AT NIGHT
- DISCONNECTED FROM THE CITY

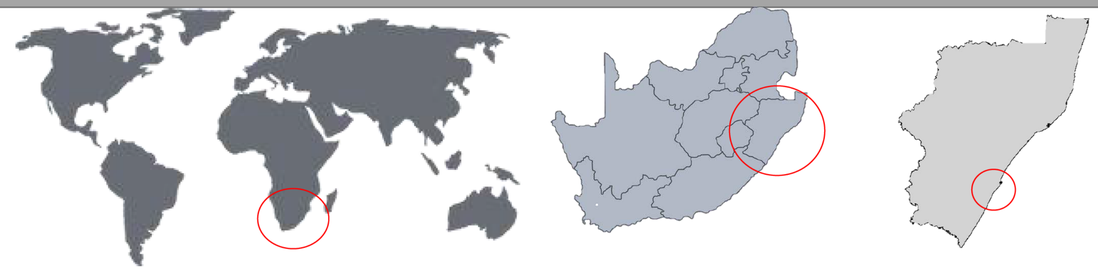
SITE 2

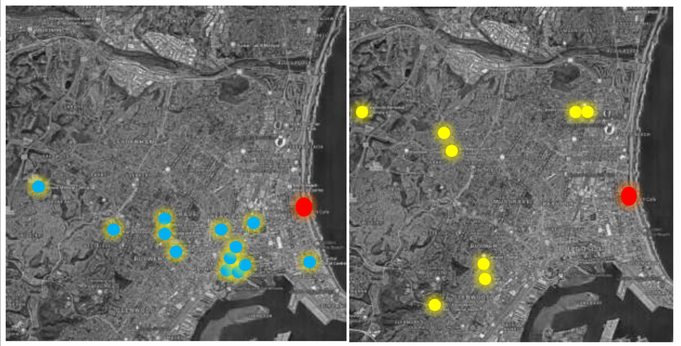


The site is located at Bay of Plenty Beach Durban Promenade, Lower Marine Parade St, South Beach, Durban, 4001

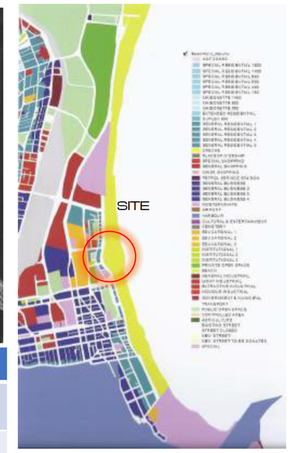
PROS:
- OPPORTUNITIES IN TERMS OF CREATING SOCIAL COHESION, SOCIALLY SUCCESSFUL AREA TO CREATE AWARENESS FOR PEOPLE WITH DISABILITIES
- DIVERSE DEMOGRAPHIC OF PEOPLE AND CULTURE.
- VIBRANT COMMUNITY(SKATE PARK, MARKET, OUTDOOR GYM)
- CLOSE TO OTHER FACILITIES THAT CATER FOR THE DISABLED

CONS:
- OCASSIONALLY VERY BUSY





LEGEND	
	SPECIAL NEEDS SCHOOL
	MEDICAL CENTERS
	SITE

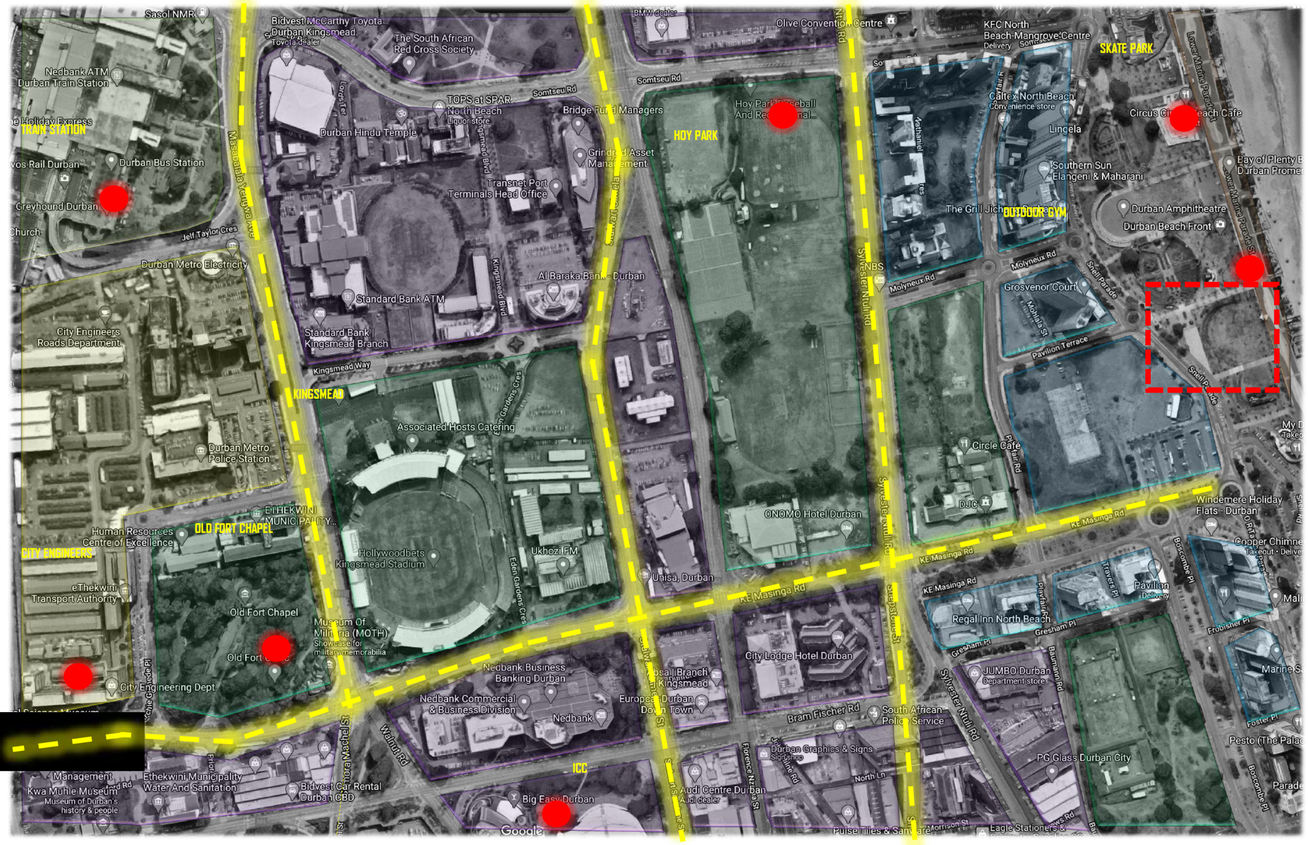


Land-use zoning



Property value zoning

MACRO ANALYSIS





KE MASINGA ROAD



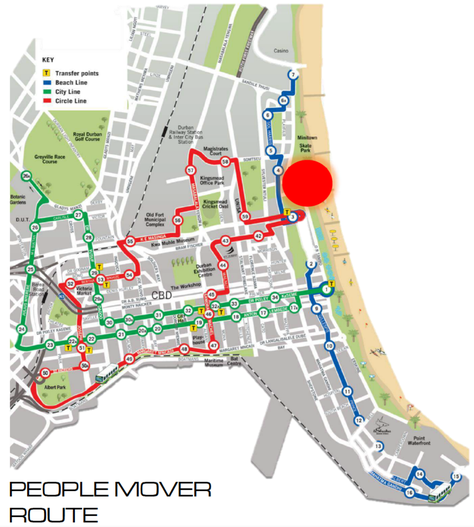
SYLVESTER NTULI ROAD



MASABALA LA YENGWA ROAD

LEGEND

- GOVERNMENT AND MUNICIPAL RESERVATION
- TRANSPORT
- PUBLIC OPEN SPACE
- GENERAL BUSINESS 3
- GENERAL RESIDENTIAL 5
- SELECTED SITE
- PROMENADE
- MAIN ROADS
- LANDMARKS AND PUBLIC SPACES OF ATTRACTION



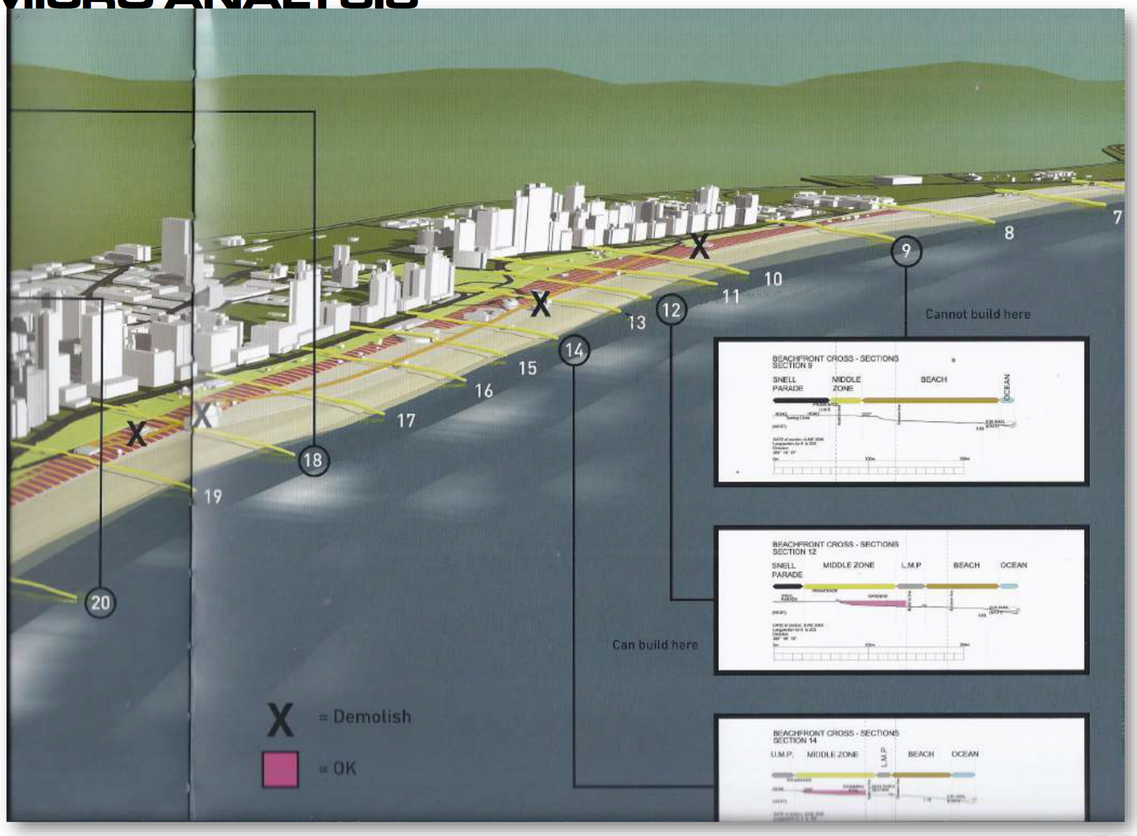
PEOPLE MOVER ROUTE

A PROPOSED EMPOWERMENT ACADEMY

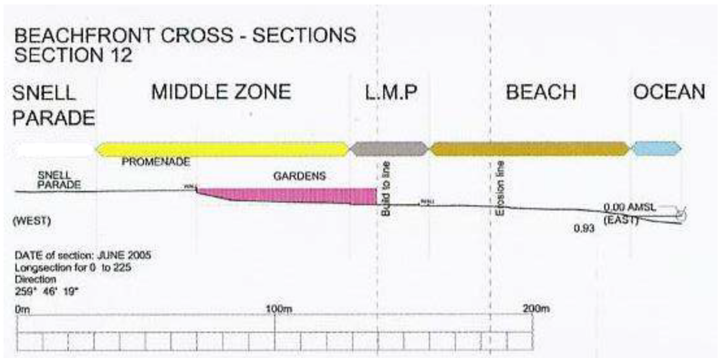
URBAN ANALYSIS

KRISHEN SINGH-
213504966

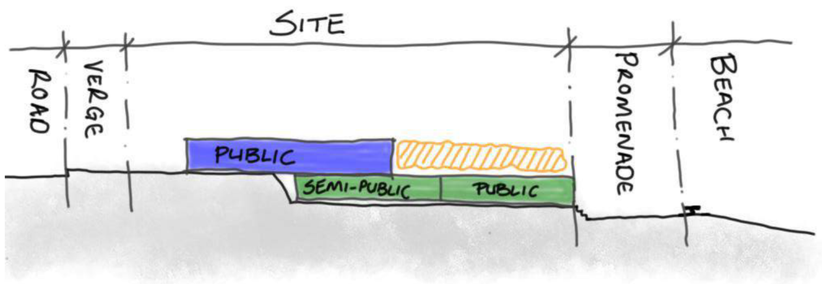
MICRO ANALYSIS



DON ALBERT AND PARTNERS ANALYSIS

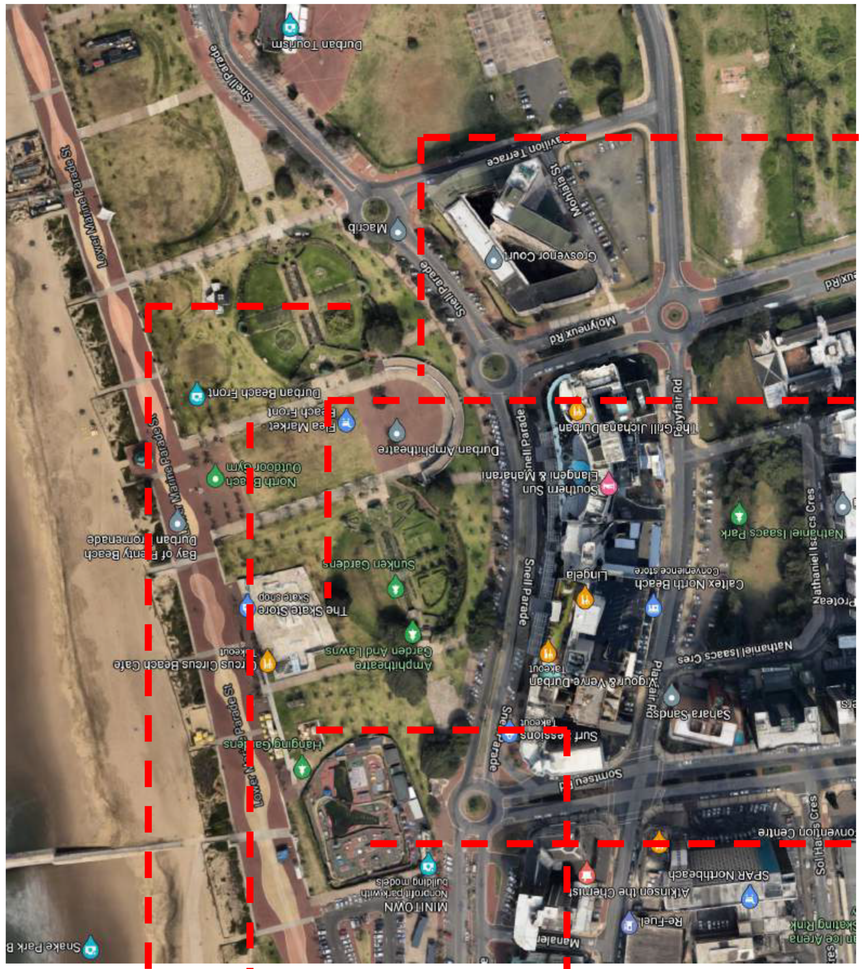


DON ALBERT AND PARTNERS ANALYSIS : SECTION

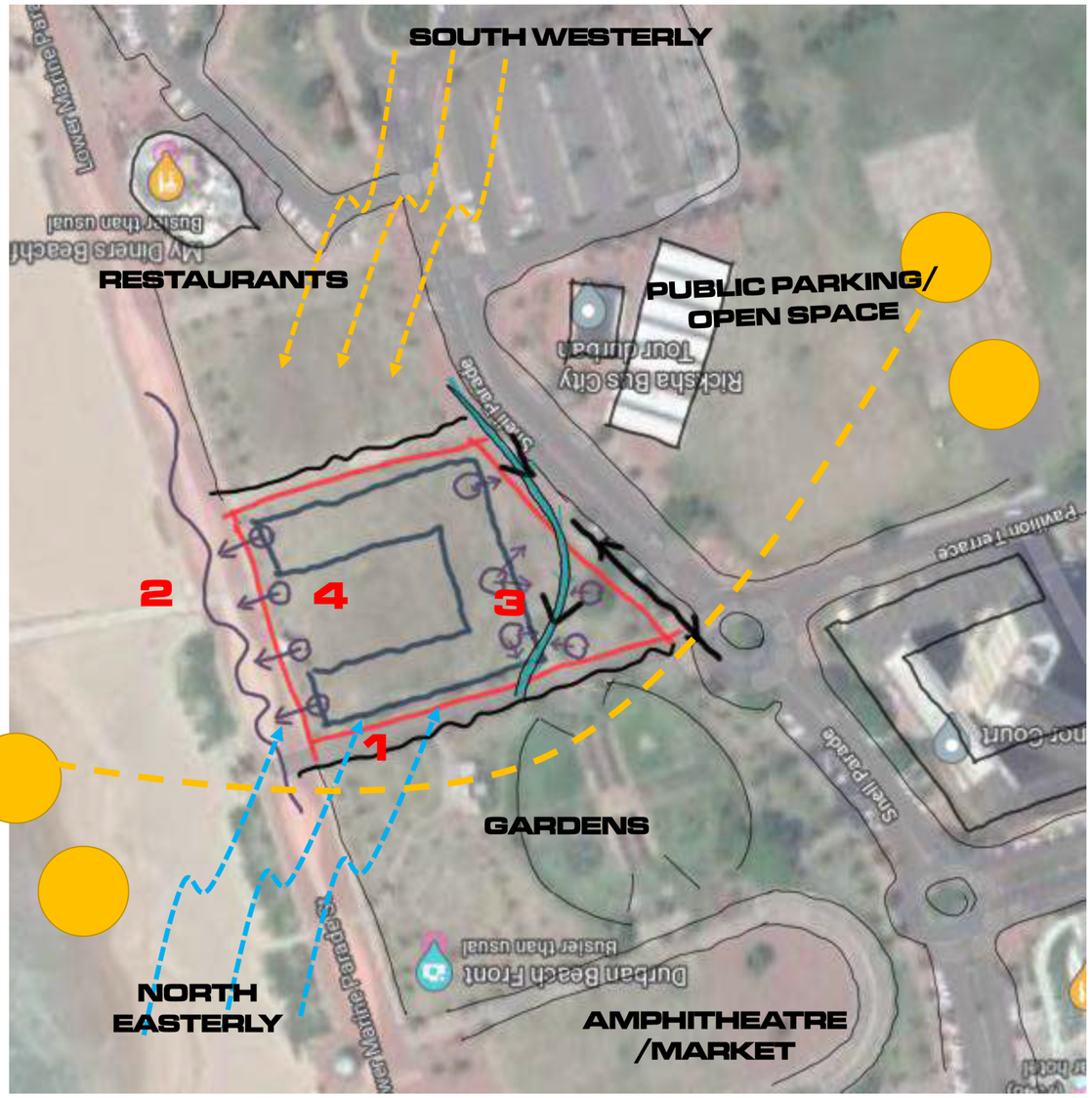


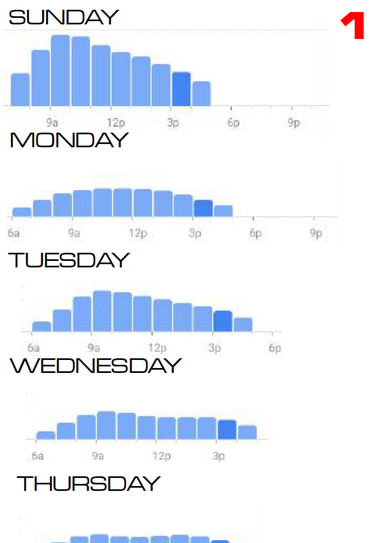
CONCEPTUAL SECTION

N


Durban Tourism
Shell Parade
Lower Marine Parade
Macrb
Glosvenor Court
Mobile St
Station Terrace
Moi Ave
Moi Ave
Moi Ave

THE INFLUENCE OF 21 ST CENTURY TECHNOLOGY FOR THE PHYSICALLY IMPAIRED IN THE BUILT FORM





GRAPH OF BUSIEST TIMES

N

1

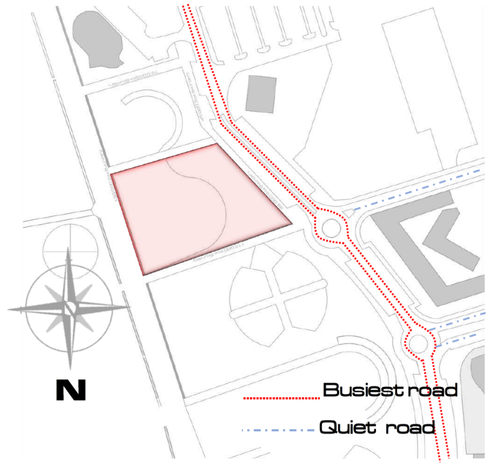


1, RAMP JOINING ROAD TO PROMENADE.. MULTIPLE SHADED AREAS.

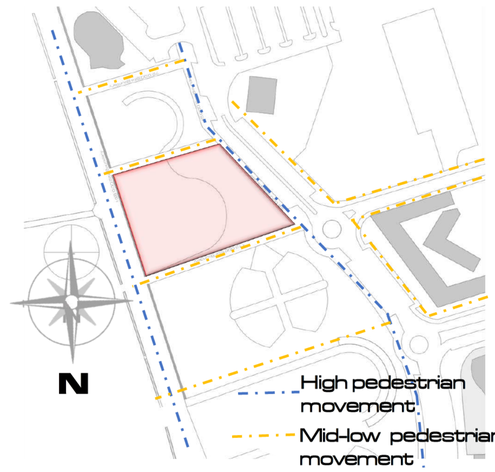
2,VIEW FROM THE PIER SHOWING HANG OUT POINTS.

3, PICTURE SHOWING PEOPLE DON'T ALWAYS WALK ON THE PATH PROVIDED. A NATURAL ROUTE CREATED ON THE GRASS.

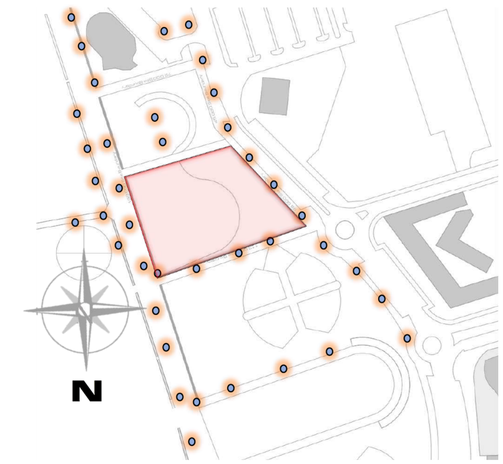
4,SPORTS BEING PLAYED ON PUBLIC OPEN SPACE



VEHICULAR MOVEMENT



PEDESTRIAN MOVEMENT

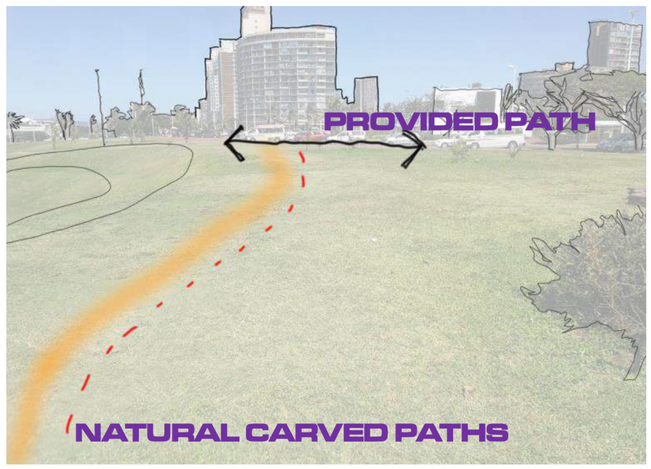


NOISE

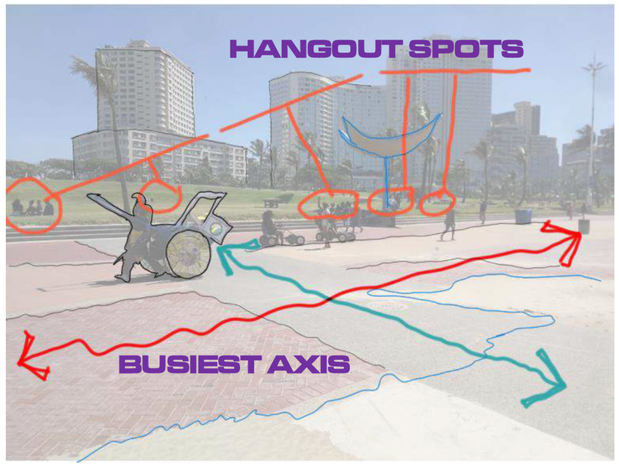
4



3



2

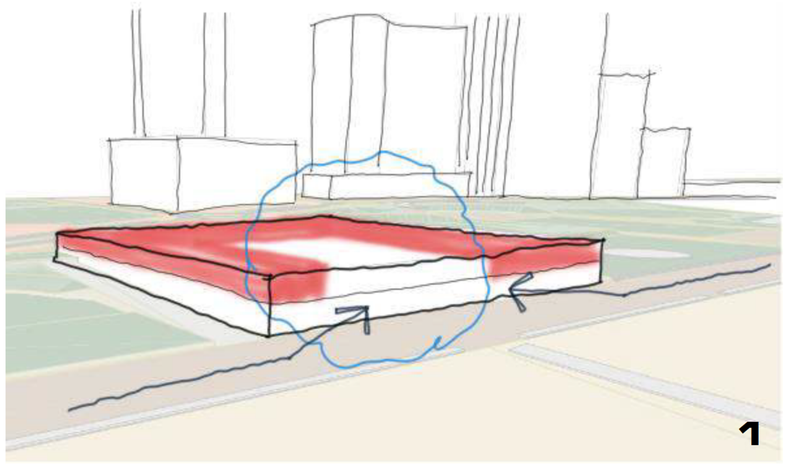


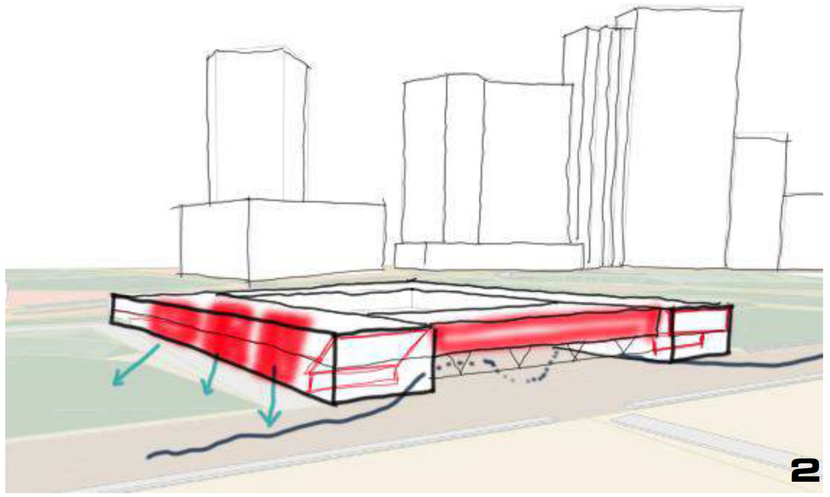
A PROPOSED EMPOWERMENT ACADEMY

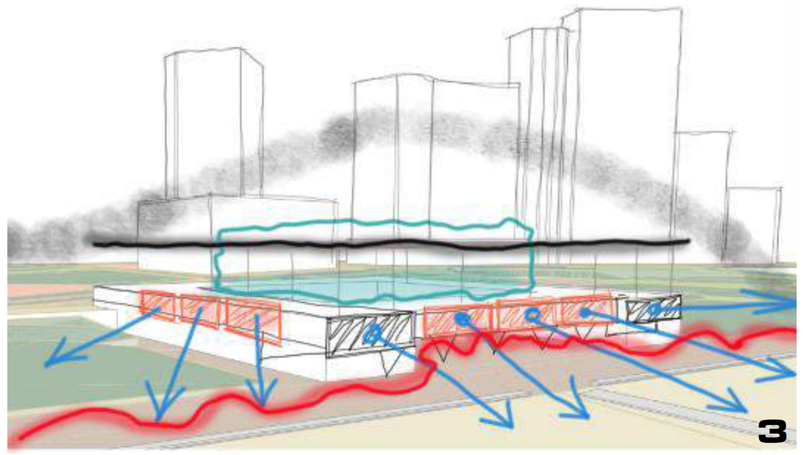
SITE ANALYSIS

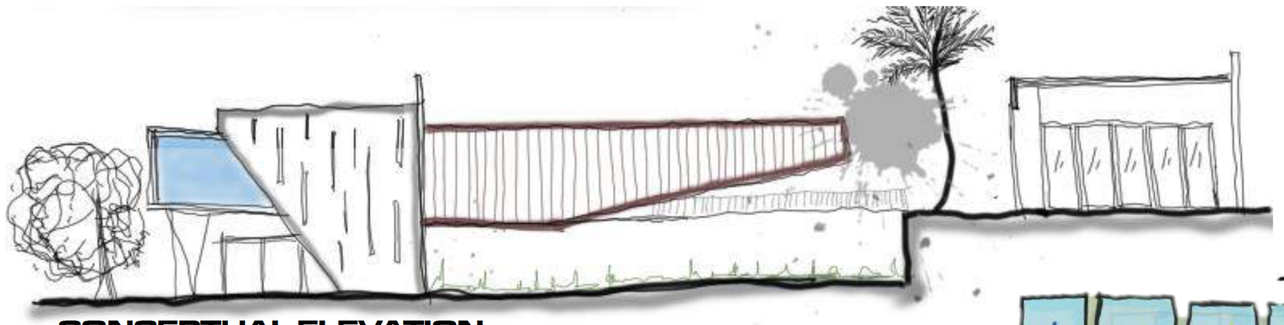
KRISHEN SINGH-
213504966

FORM DEVELOPMENT

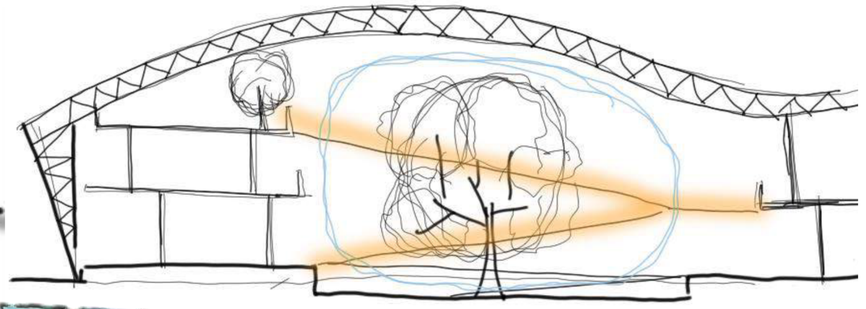




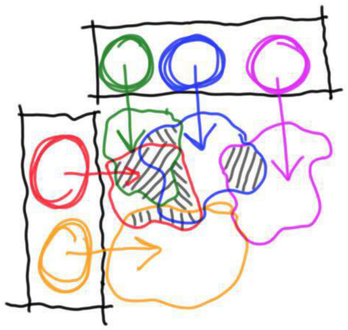


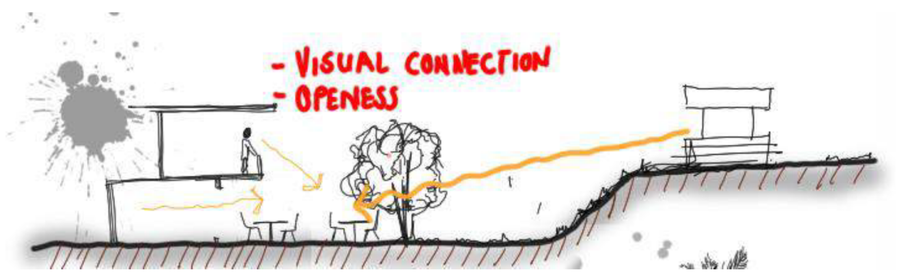


CONCEPTUAL ELEVATION

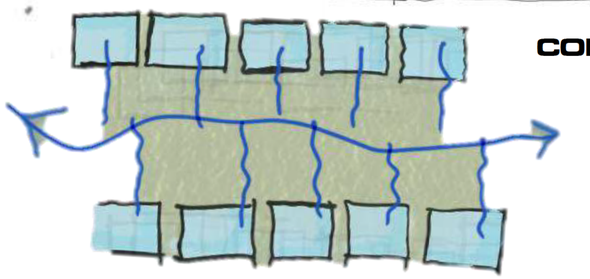


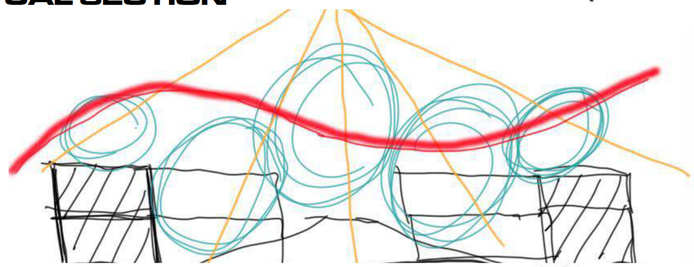
CONCEPTUAL SECTION

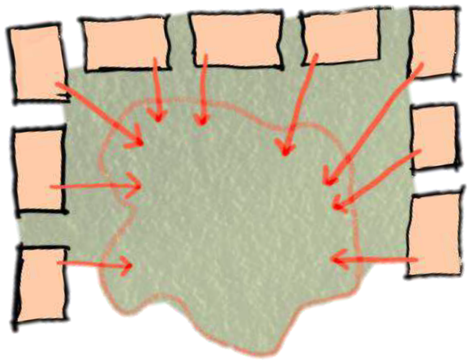


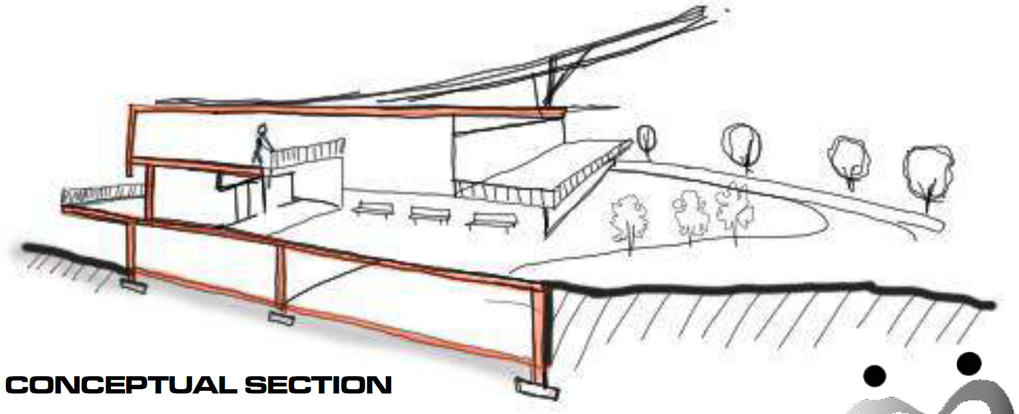


CONCEPTUAL SECTION

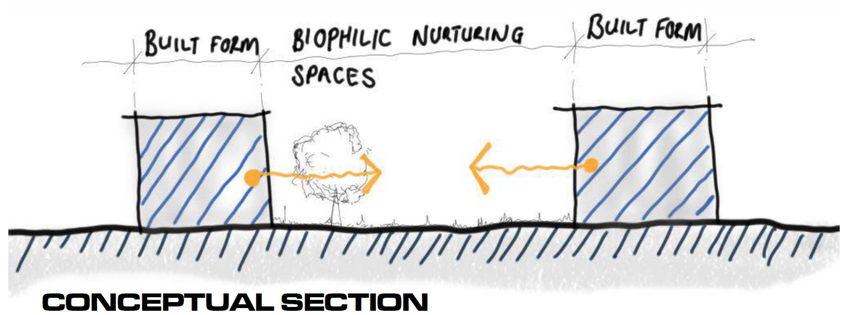








CONCEPTUAL SECTION



CONCEPTUAL SECTION

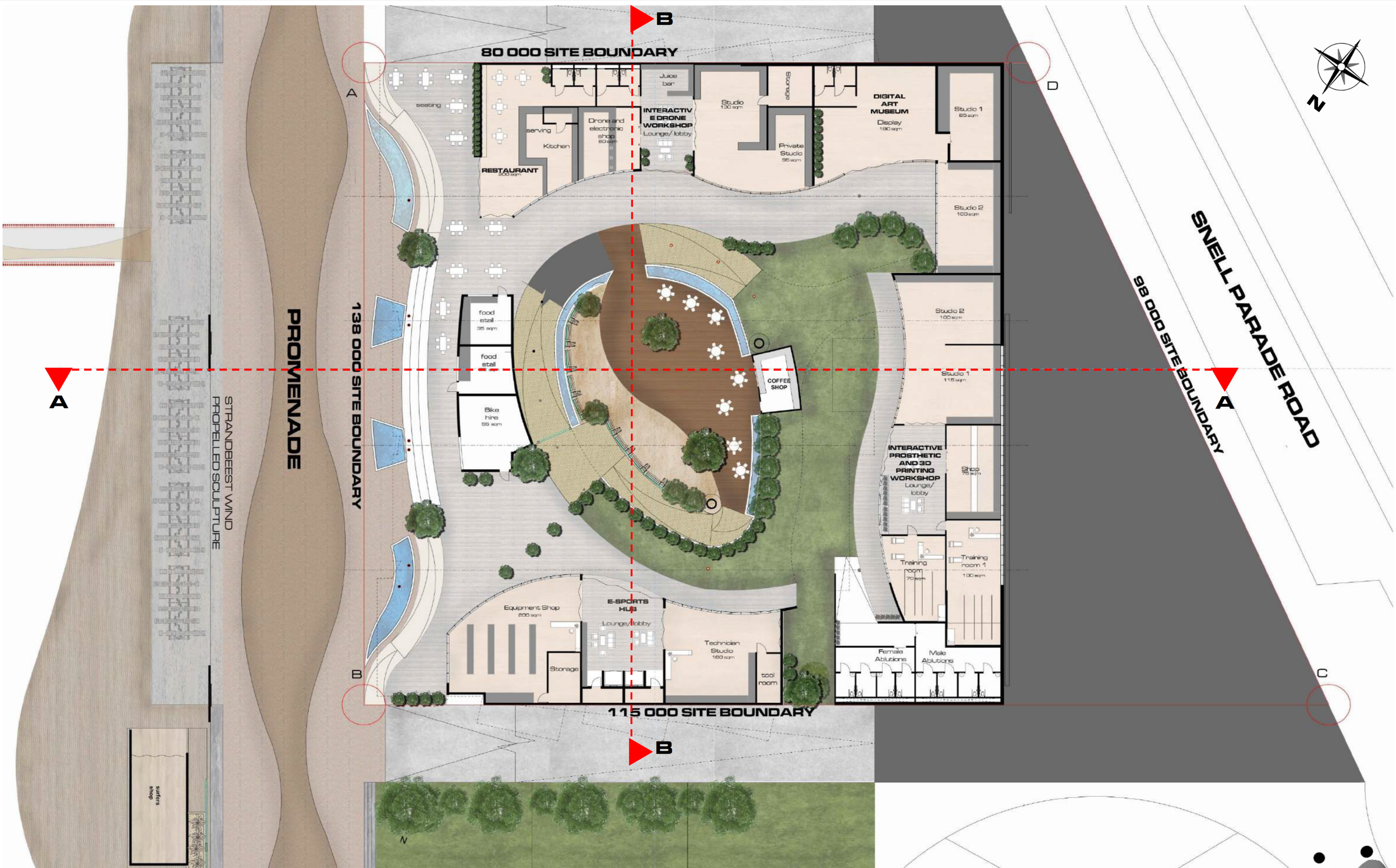


SITE PLAN
1:500

A PROPOSED EMPOWERMENT ACADEMY

SITE PLAN

KRISHEN SINGH-
213504966

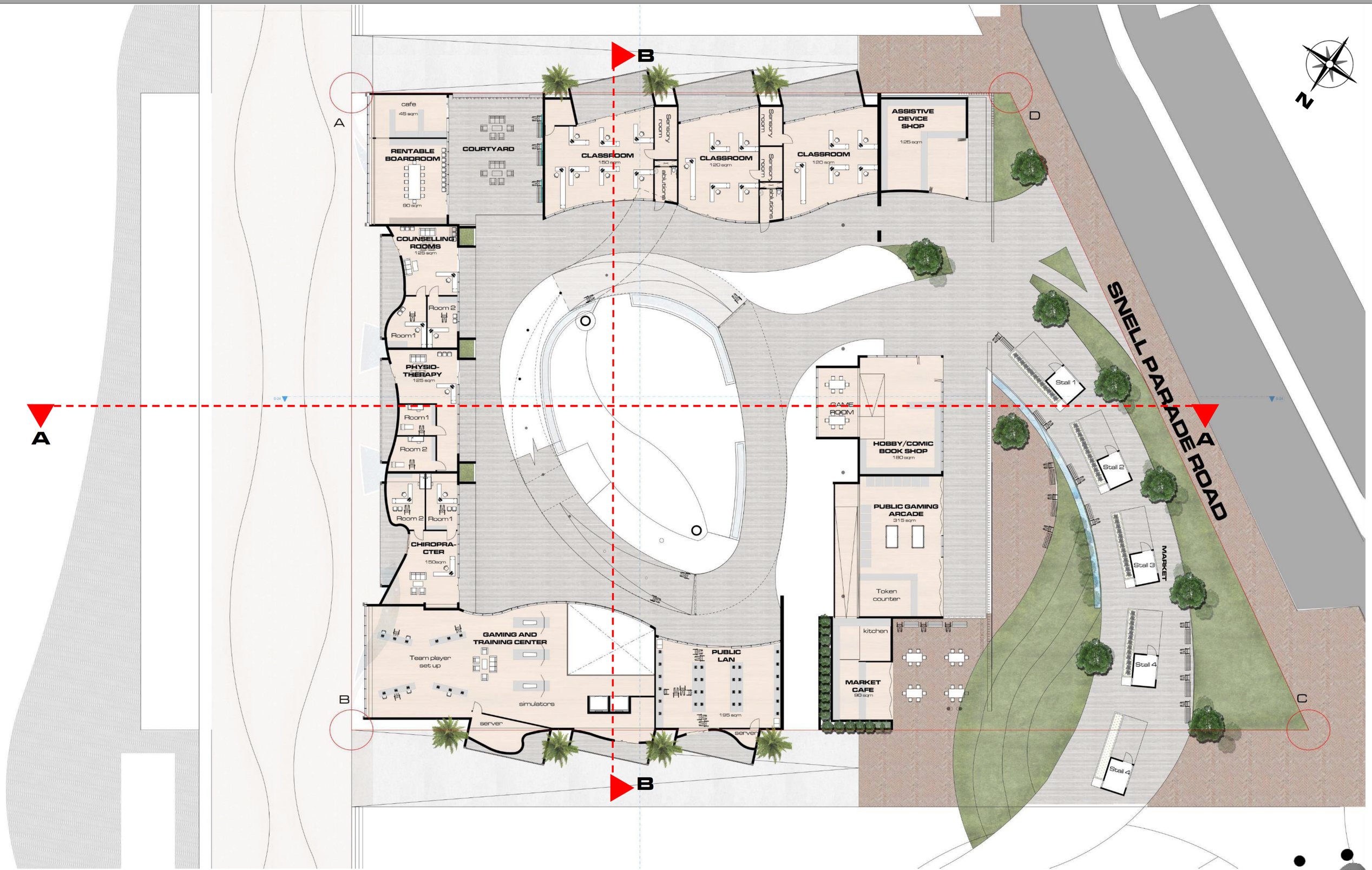


GROUND FLOOR PLAN
1:200

A PROPOSED EMPOWERMENT ACADEMY

PLANS

KRISHEN SINGH-
213504966

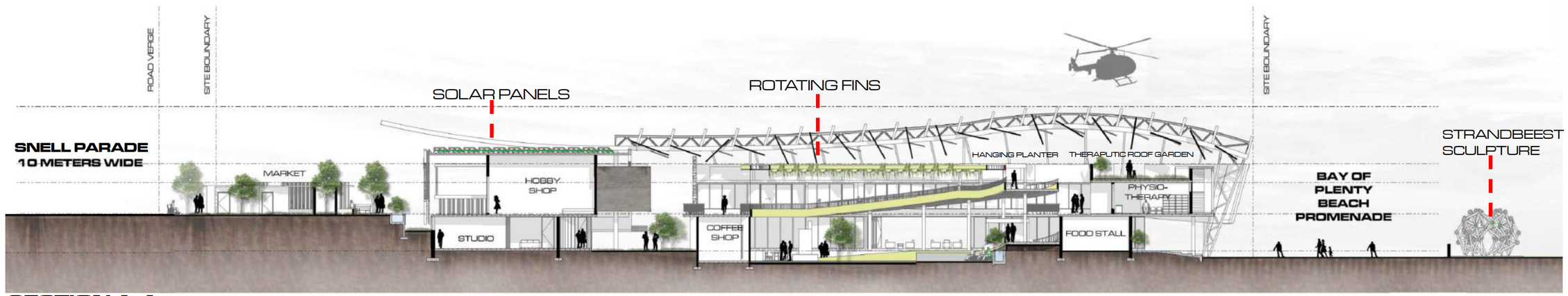


FIRST FLOOR PLAN
1:200

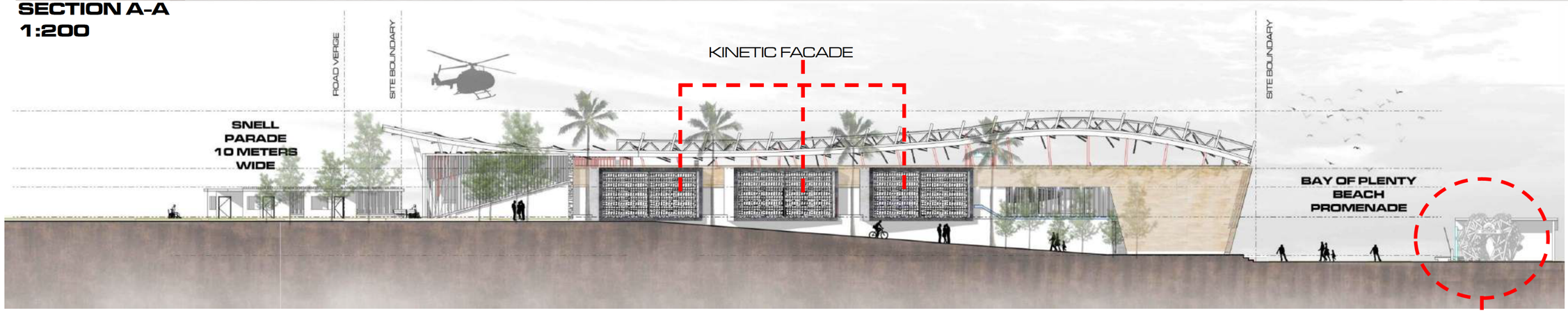
A PROPOSED EMPOWERMENT ACADEMY

PLANS

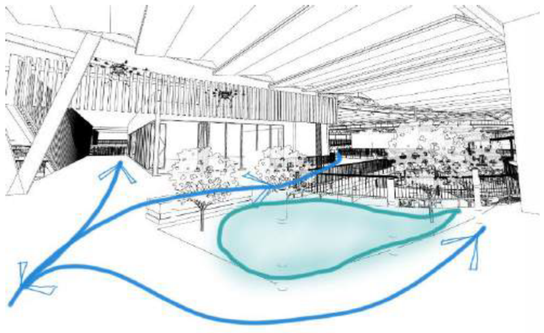
KRISHEN SINGH-
213504966



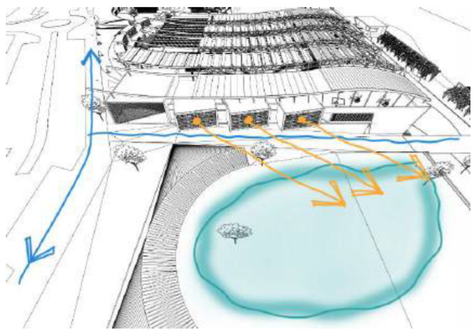
SECTION A-A
1:200



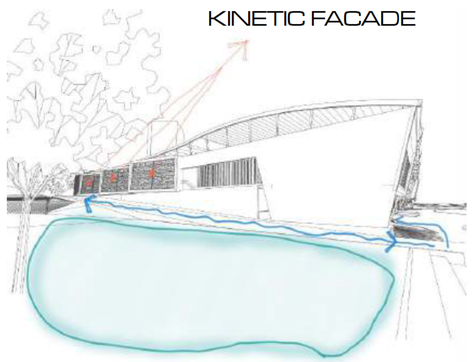
SOUTH EAST ELEVATION
1:200



WELCOMING AND ACCESSIBLE ENTRANCE



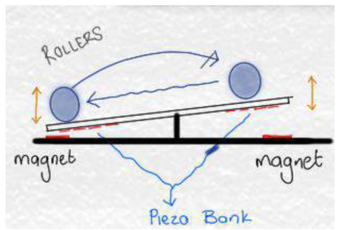
ADJACENT GREEN SPACE

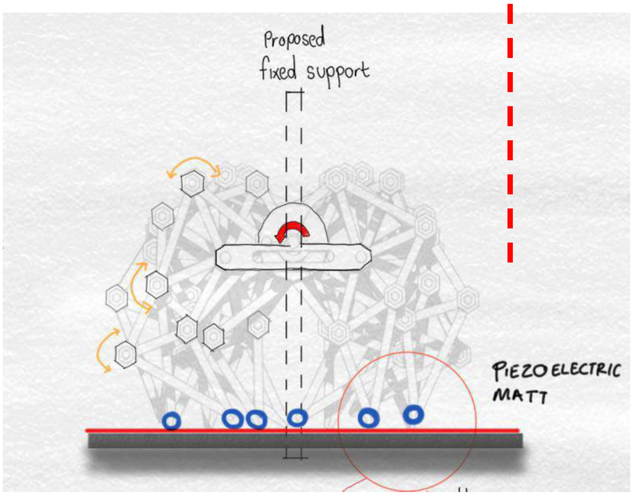


ADJACENT GREEN SPACE

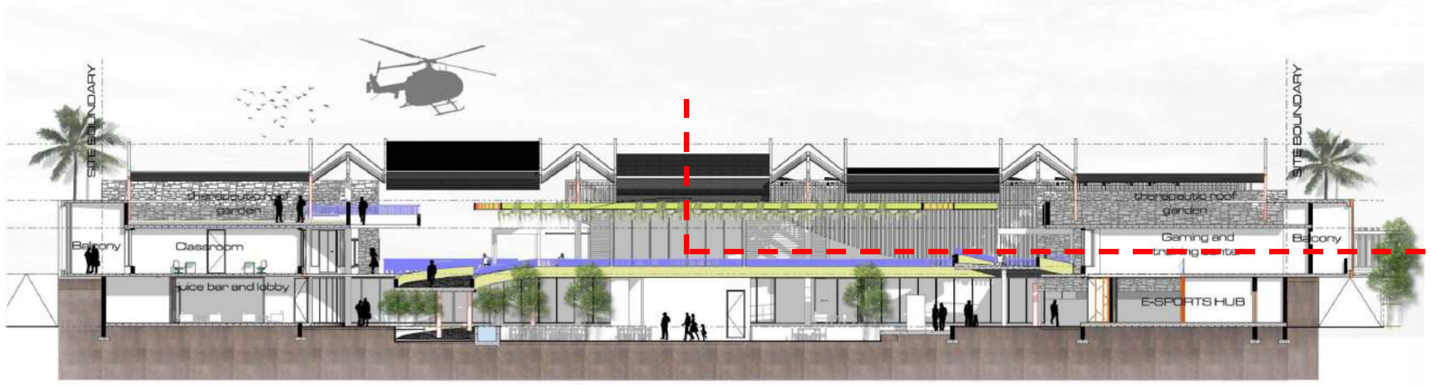


SOUTH EAST ELEVATION





STRANDBEEST SCULPTURE



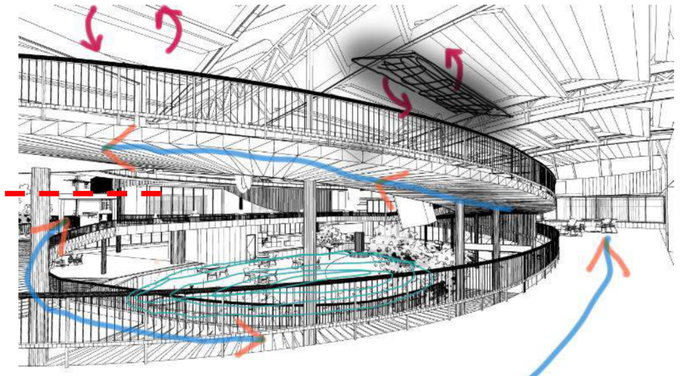
SECTION B-B
1:200



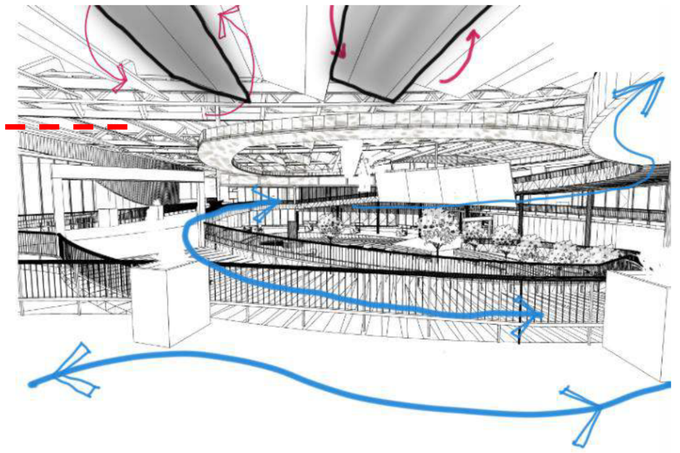
NORTH EAST ELEVATION
1:200



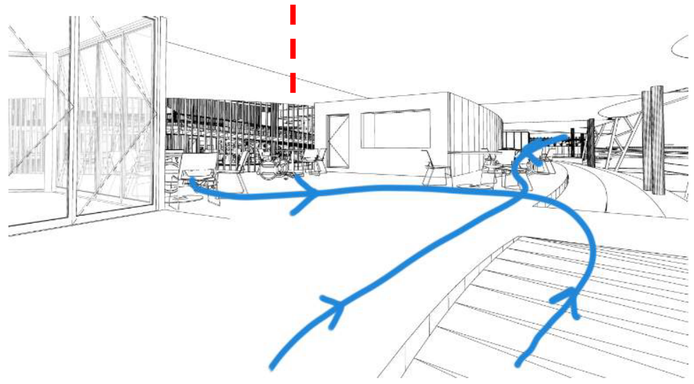
NORTH EAST ELEVATION
1:200



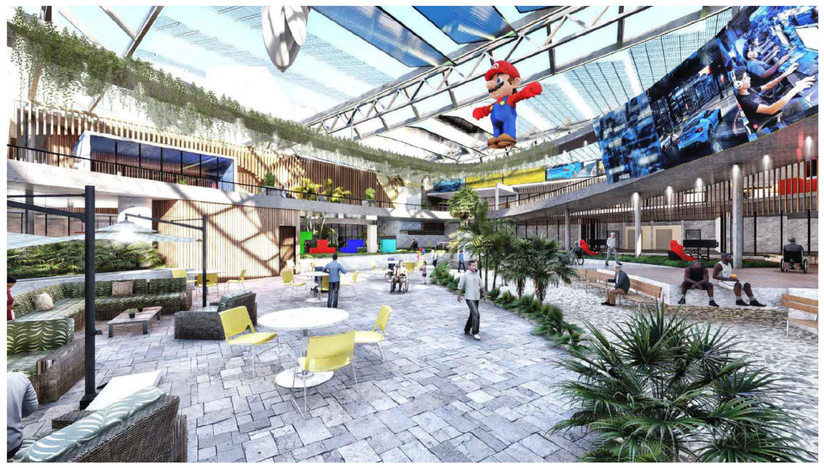
INCLUSIVE RAMPS AND COURTYARD



INCLUSIVE RAMPS AND COURTYARD



INCLUSIVE PROMENADE EDGE





A PROPOSED EMPOWERMENT ACADEMY

SECTIONS AND ELEVATIONS

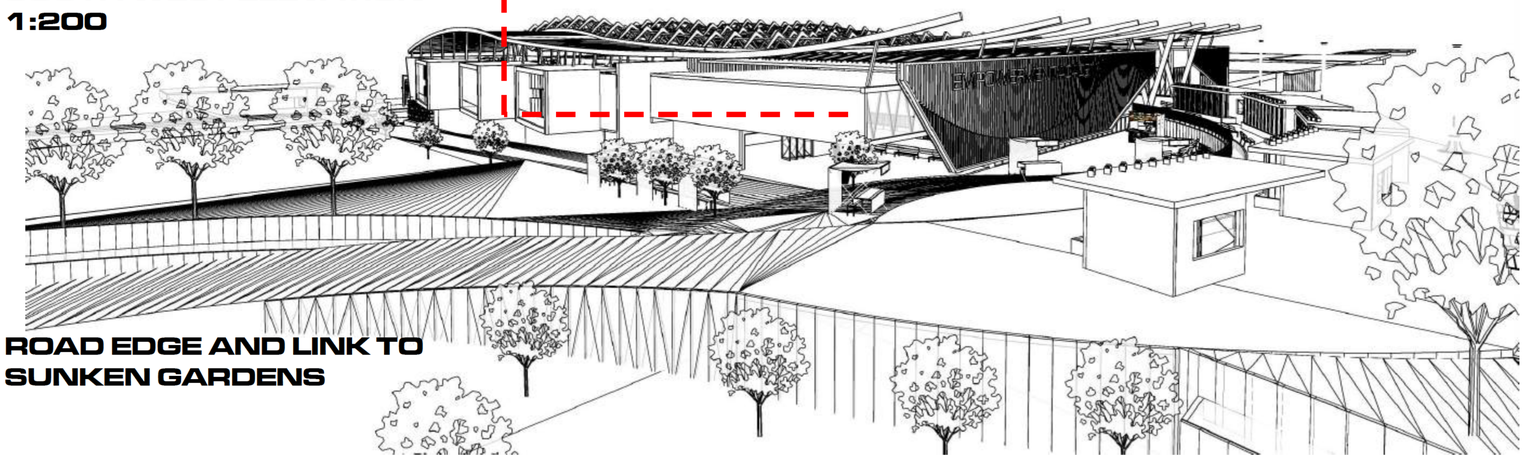
KRISHEN SINGH-
213504966



NORTH WEST ELEVATION
1:200

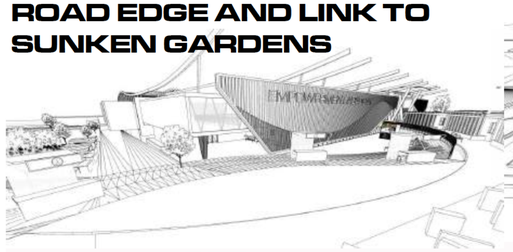


SOUTH WEST ELEVATION
1:200

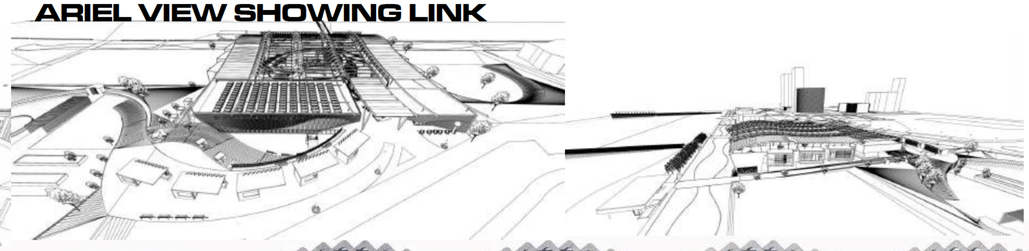


ROAD EDGE AND LINK TO SUNKEN GARDENS

ROAD EDGE AND LINK TO SUNKEN GARDENS



ARIEL VIEW SHOWING LINK









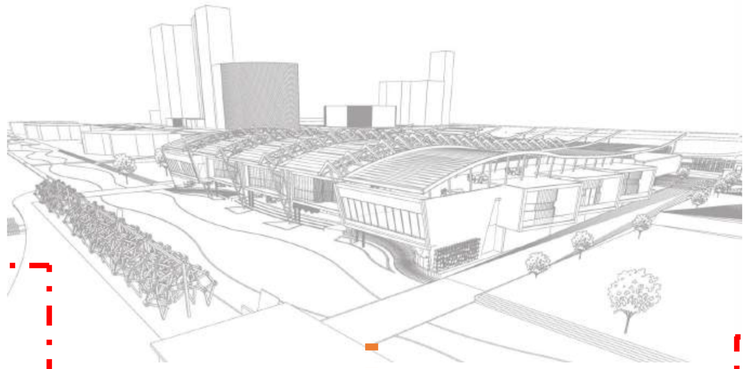
SOUTH WEST PERSPECTIVE

A PROPOSED EMPOWERMENT ACADEMY

ELEVATIONS AND 3D

KRISHEN SINGH-
213504966







GIRDER STRUCTURE CREATING A VARIATION OF VOLUME IN CENTRAL SPACE

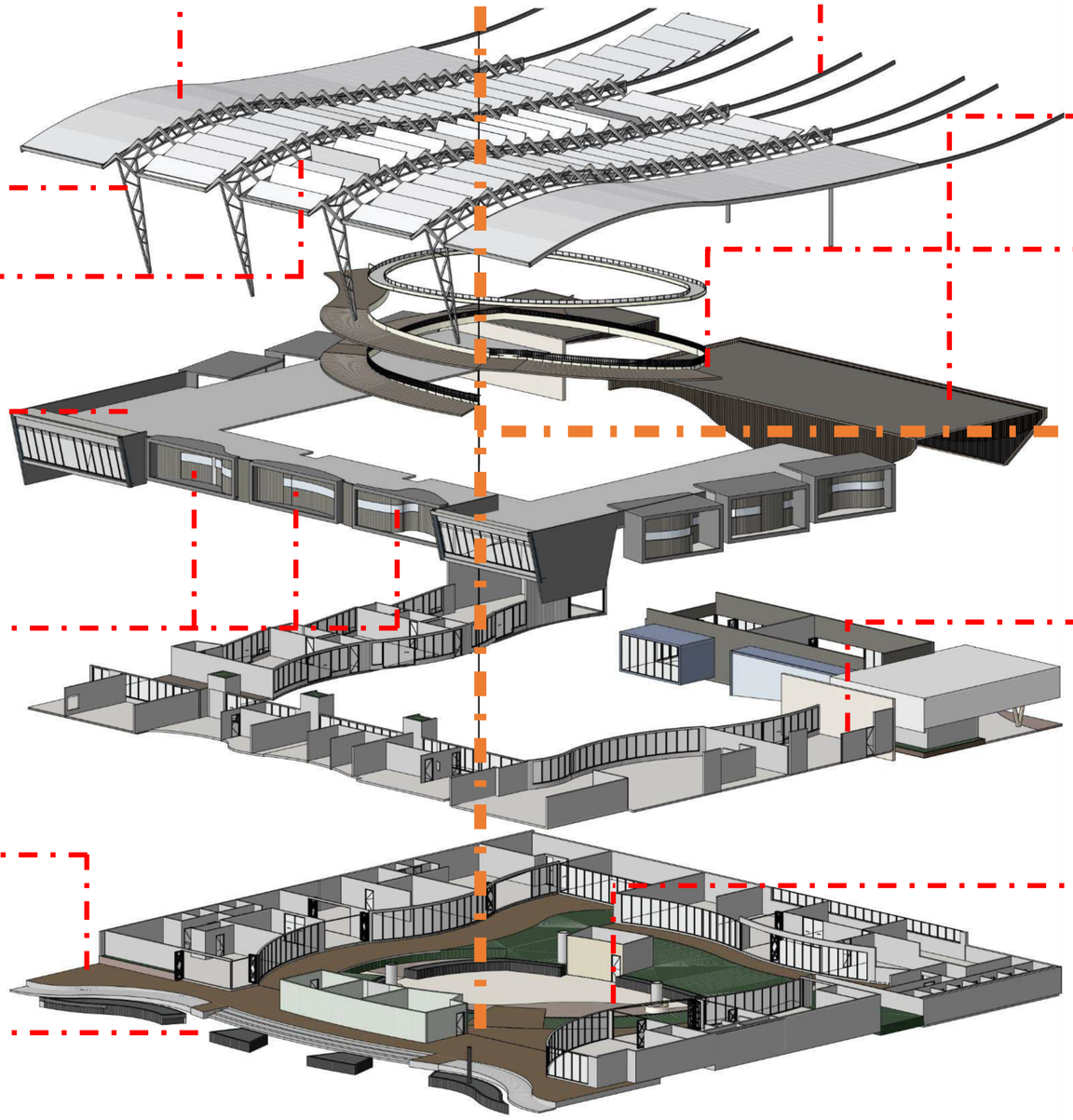
INNOVATIVE ROOF. FINS USING WIND TO GENERATE ELECTRICITY

THERAPUTIC ROOF GARDEN

SPACES MAXIMISING VIEWS

INCLUSIVE DECK WITH SPILL OVER ACTIVITIES

BREAK OF ACCESS FROM PROMENADE TO FILTER PEOPLE INTO SITE



SOLAR PANELS

INTERACTIVE RAMP LINKING FLOORS

VISUAL CONNECTION BETWEEN FLOORS , RAMPS AND SPACES

OPEN SPACES WITH OVERLAPPING ACTIVITIES

SUNKEN HOLOGRAM COURTYARD

A PROPOSED EMPOWERMENT ACADEMY

EXPLODED AXONOMETRIC

KRISHEN SINGH-
213504966

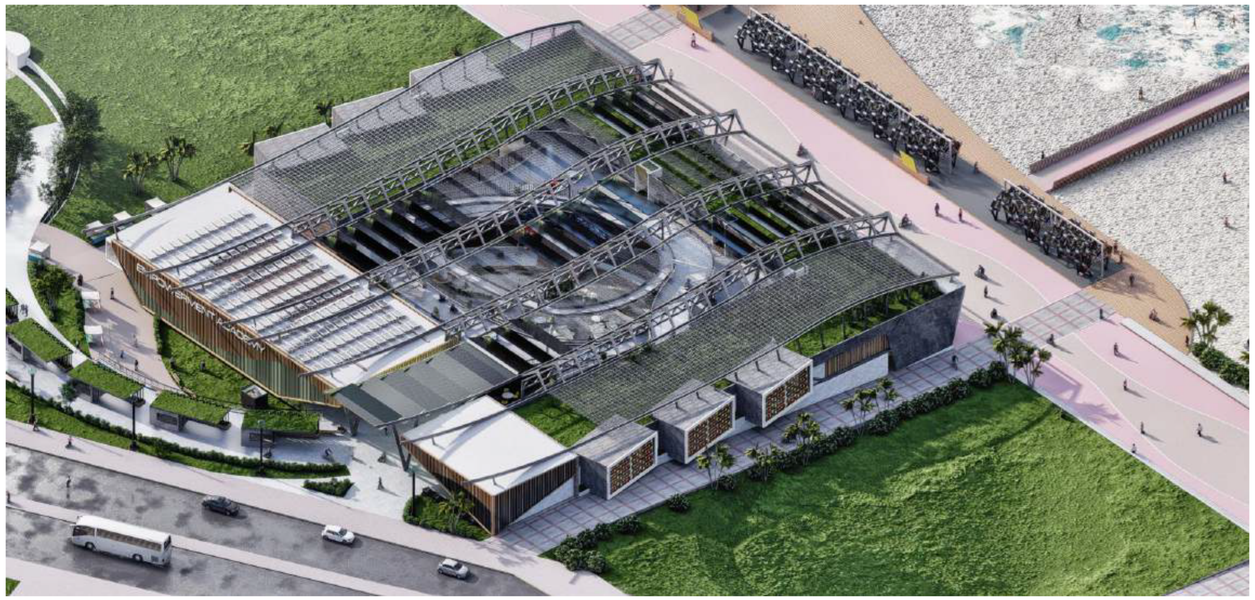
ARIEL VIEW 1



ARIEL VIEW 2



ARIEL VIEW 3



ARIEL VIEW 4



ARIEL VIEW 5



VIEW FROM PROMENADE



ROAD ENTRANCE



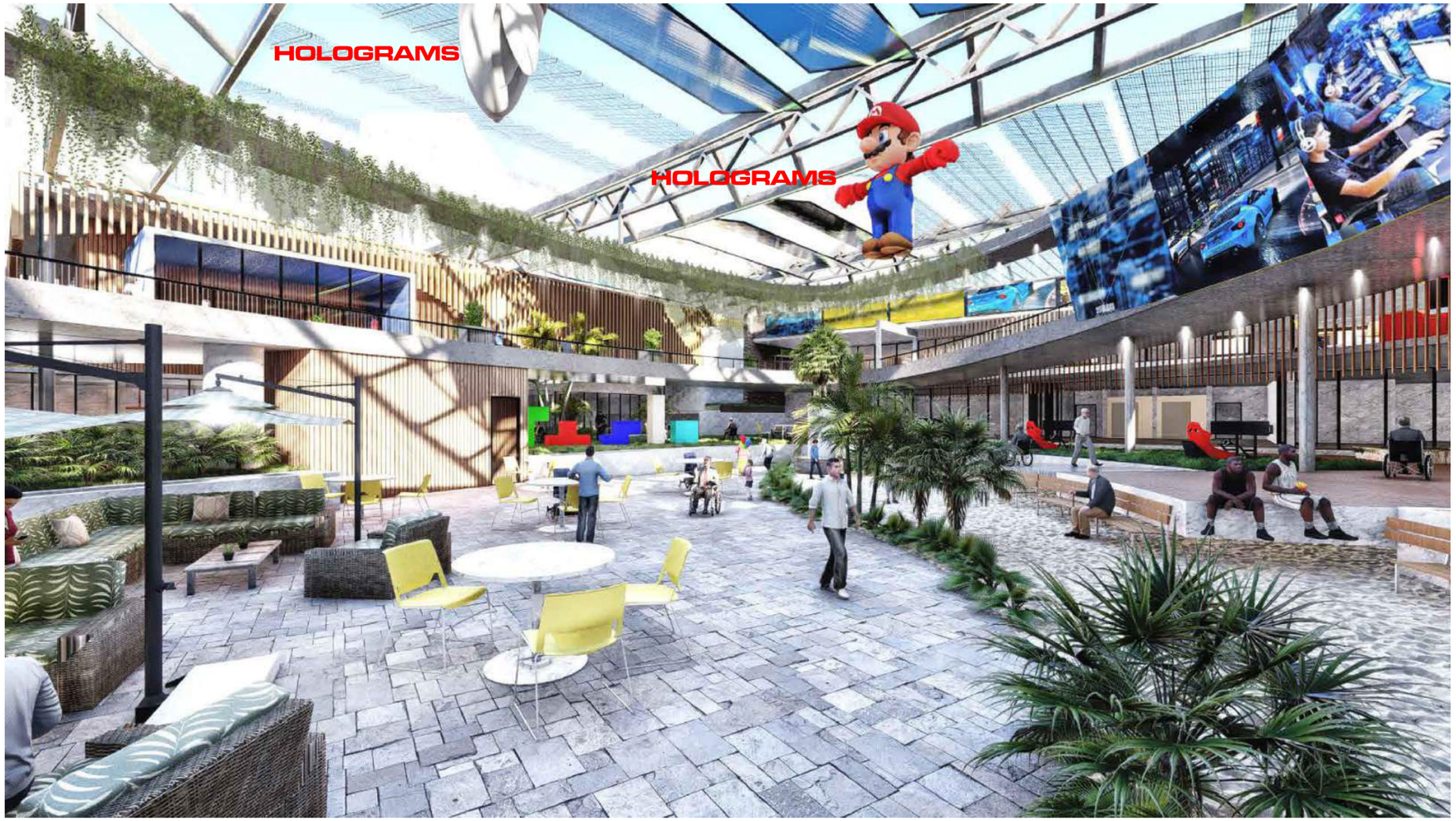
VIEW FROM BEACH



VIEW FROM ROAD VERGE



VIEW OF HOLOGRAM COURTYARD



VIEW OF HOLOGRAM COURTYARD



VIEW OF ENTRANCE FROM ROAD EDGE



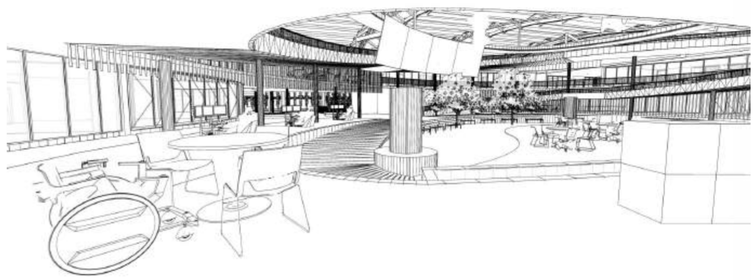
VIEW OF COURTYARD



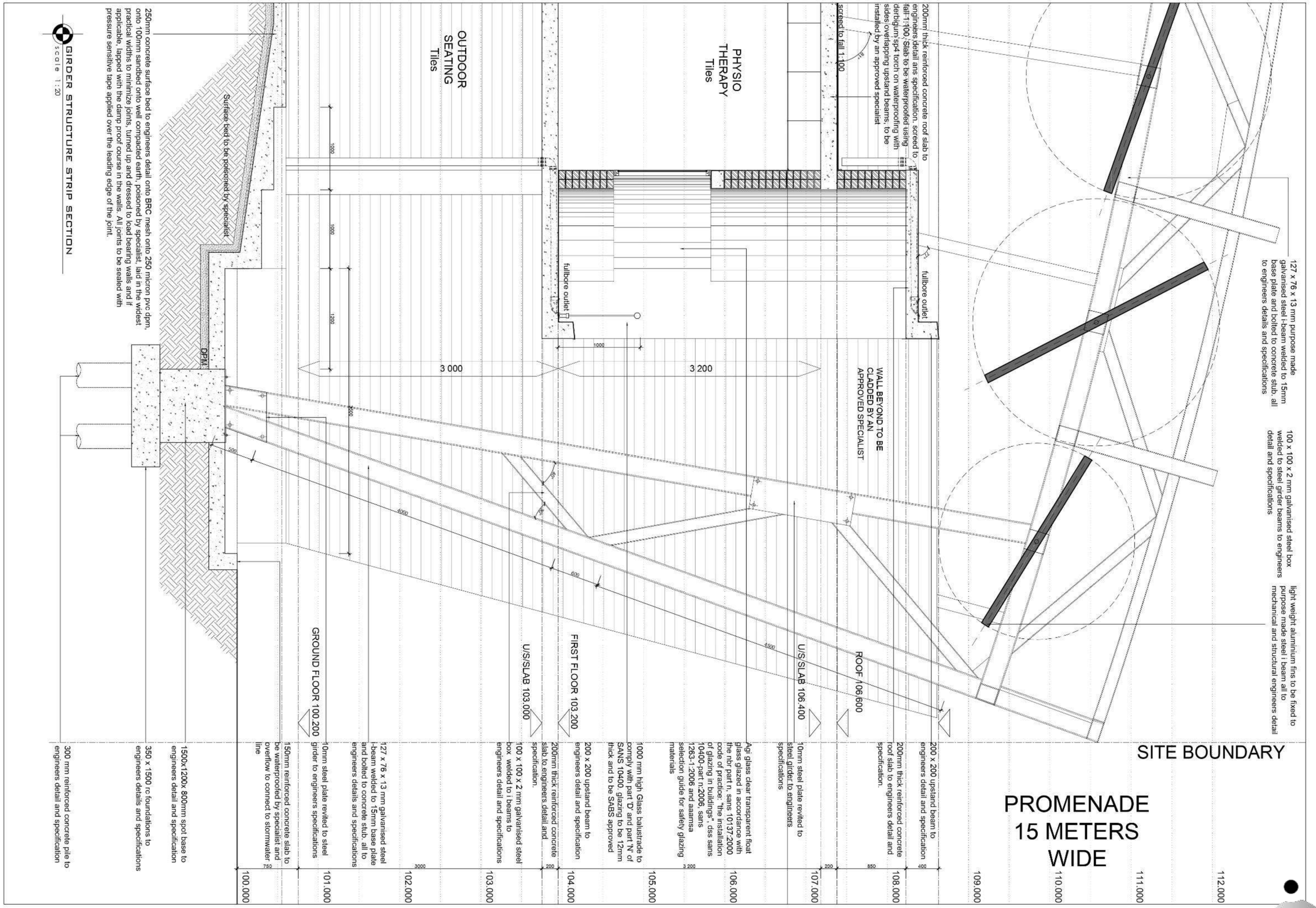
ARIEL VIEW



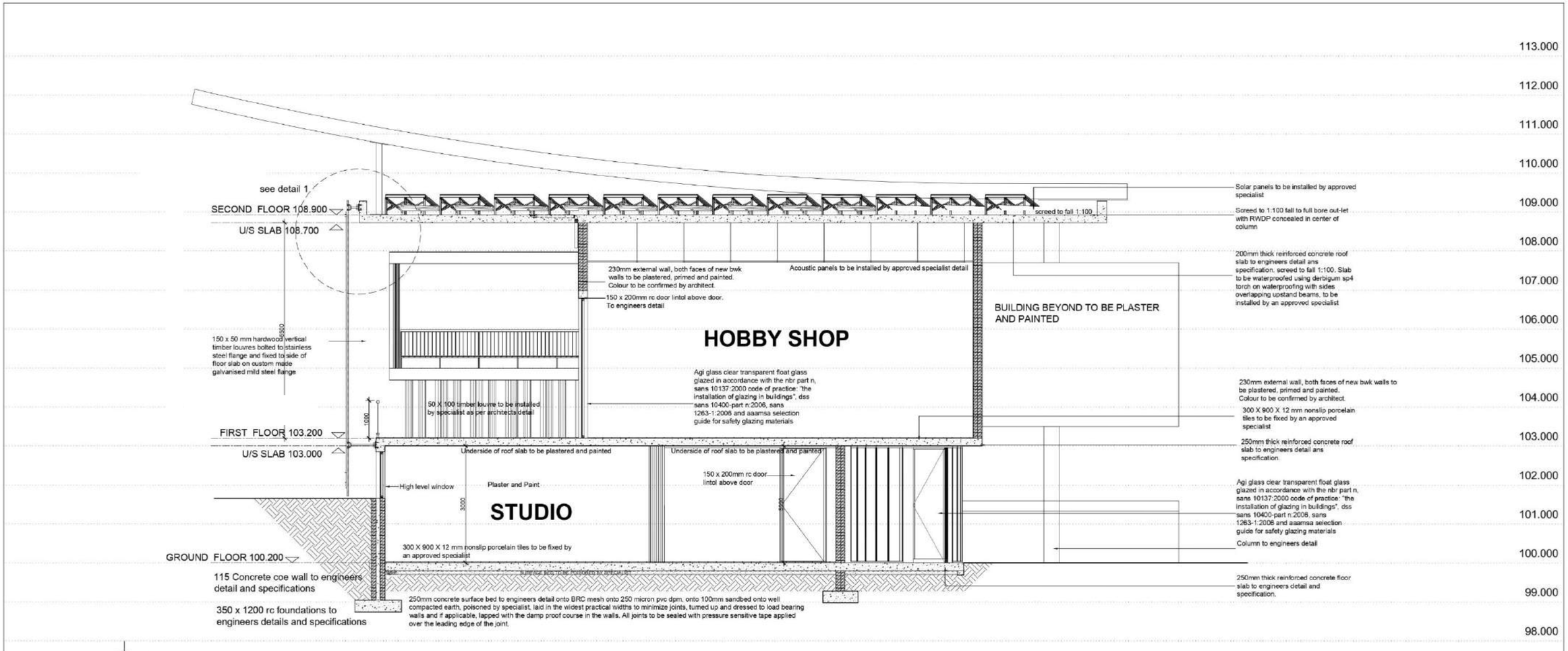
VIEW OF INTERACTIVE RAMP



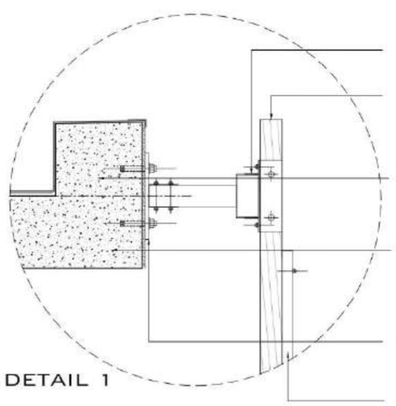
VIEW OF COURTYARD



GIRDER STRUCTURE STRIP SECTION
scale 1:20



CROSS SECTION
scale 1:50



DETAIL 1

220mm brickwork walls plastered on both sides and finished of with two coats undercoat and one coat PVA

50 x 50 mm aluminium anglelite bolted to wall and fixed to 150 x 80 x 3 mm aluminium box setion

150 x 50 mm hardwood vertical timber louvres to be fitted to custom made gms flange using m15 corrosion resistant bolts

250 x 300 reinforced concrete upstand beam to enineers detail and specification

200mm thick reinforced concrete floor slab to engineers detail ans specification. screed to fall 1:100. Slab to be waterproofed using derbigum sp4 torch on waterproofing with sides overlapping upstand beams, to be installed by an approved specialist

5mm steel plate fixed to upstand beam using m8 anchor bolts

38 x 38 mm hardwood vertical timber louvres to be fitted to custom made gms flange using m15 corrosion resistant bolts