A RESPONSIVE ARCHITECTURAL STRATEGY FOR THE GENERATIONS OF SMART COMMUNITIES:

An integrated Tech Hub in Welbedacht, Durban

By:

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ACKNOWLEDGEMENTS

DEDICATION

My creator for blessing me with the opportunity to further my education, a supportive family and the strength to go on.

To my parents…

Papa

The year you left me is the year I get to close this chapter of my life.

A hero without a cape, a father that is my soul, I would never have made it this far without you.

Your heart may have stopped beating but you will forever be my soul, my essence

Always and Forever Dawood's Daughter

Mummy

Words unspoken, your smiles the token that got me through.

For always believing, supporting and understanding.

You are courage, you are bravery you are my mum.

Your Warrior

ABSTRACT

The social and economic development of peri-urban communities are often overlooked by government contributing to a centralized development approach. This approach encourages migration to areas with more opportunity, preventing development of the underserved community. The uneven distribution of developmental resources and facilities leads to the manifestation of the assumption that opportunities to progress are centralized to certain areas of the city. This divide affects the communities' morale to empower themselves within their locale thereby hindering their development and growth. In order for South Africa to foster a developmental state, it is vital to create initiatives in underserved peri-urban communities such as Welbedacht, that are more inclusive and empower individuals to control their own development.

The theories presented in this research is an attempt to understand how architecture, responding to current issues in peri-urban communities, can act as a social agency for change to help enable, integrate and empower underserved peri-urban communities. Answering the research question, "What is the role of the built environment in enabling, integrating and empowering communities?" Place theories are applied to understanding people; linkage theories are applied in order to understand the needed infrastructure and theories of Socio-Ecological Resilience is applied in order to understand the design principles needed to achieve a holistically responsive architecture. Unilaterally connected, the theories will be applied so that connection between the theories provide a design strategy for sustainable development of smart peri-urban communities

Explored in the research is architectural examples that encompass the principles identified through literature review, tectonic, technique and technology. Although the context of the precedent has similarities, no site is the same and therefore the community of Welbedacht is explored in detail (social, economic and environmental context).

With an aim of sustainable development, the research focuses on a design outcome to encourage and facilitate active participation of citizens in the development of their communities.

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INTRODUCTION:

"Architecture has to be greater than just architecture. It has to address social values, as well as technical and aesthetic values."
-Samuel Mockbee, Architect and Founder of Rural Studio, Auburn University

1.0 INTRODUCTION

The seemingly insurmountable issues of urban inequality experienced globally has emphasized a growing need to transform our cities. While many cities rely on local government to change their circumstances, the unequal distribution of municipal resources gives rise to many questions. How do we ensure that all citizens have access to opportunities and city resources? Can we continue to take top-down approaches to development? What is the role of architecture in providing solutions to these issues?

Despite the advancement and progression made in cities, the exclusions and inequality of poorer communities continue to grow. In order to make a transformative change in cities, a responsive and innovative approach needs to be taken. Responsive architectural strategies provide an alternative to cookie-cutter development, by encouraging a bottom-up approach which places people and communities at the heart of the design. Finding the connection between social need, built environment and the social urban fabric, architecture can address contextual issues with resourcefulness by harnessing the cities assets in order to generate 'smart communities'.(Shannon, K. and Smets, M., 2010)

While the English Oxford Living Dictionary (2019) defines community as" "*all the people who live in a particular area or place*", with the rapid increase in urban sprawl and the growing need for an inclusive city, it has become crucial to connect the collective urban environment. Unrestricted by physical boundaries, inclusive cities allow for fragmented urban spaces to form a collective social urban fabric avoiding the manifestation of issues such as urban inequality and isolation. "*An inclusive city is one that values all people and their needs equally. It is one in which all residents—including the most marginalized of poor workers—have a representative voice in governance, planning, and budgeting processes, and have access to sustainable livelihoods, legal housing and affordable basic services such as water/sanitation and an electricity (*Douglas. R, 2013)

Smart Cities, through managing city assets with communication technology, provides an efficient solution to active governance by mobilising and initiating a connection

between communities and city authorities. Due to its association with access to ICT (information communication technology) and the collection of population data, 'smart cities' is often seen as a top-down approach. (Ballon, P. and Schuurman, D., 2015) However, by harnessing the virtual modern infrastructure of smart cities, geographically fragmented urban spaces can be connected.

Exploring an alternative bottom up approach., the proposal of "Smart communities" encourages putting people and communities at the centre of the design. While 'Smart' in both approaches offer a system of connection that has the potential to influence how people interact and connect with the city, 'Smart Communities' applies systems of connection and data collection proposed by 'Smart Cities' while still encouraging participatory action and innovation in the development of their own communities. (Andersen. C.S., 2014) (Gurstein M., 2014). Although this system of connection does not have a physical manifestation, it introduces a new form of infrastructure, using virtual mobility to connect communities restricted by physical barriers.

Smart communities empower citizens to transform their locale by using information and communication technology to improve their lives through co-creation and active participation. Creating strong networks and links, smart communities promote inclusive cities by improving the access to and division of economic and social benefits within the context of cities. (Lindskog, H., 2004, April Vol. 16, pg 14-16).

This research does not intend to provide a technological solution for the networking of communities but will explore the role of architecture in creating dynamic spaces that connects, enables and empowers communities, fostering innovation and development within the locale.

STRUCTURE OF THE DISSERTATION:

Chapter one:

Exploring peri- urbanism, the research background touches the benefits of the inclusion of technology in national development plans. The potential of connecting social developmental facilities in the city of Durban is investigated through the links between the historic context and current state of peri-urban communities in South Africa. The context of the design is introduced briefly as a case study and will be explored further in the chapters to follow.

The motivational response discusses the necessity of research, upon which key questions critical to the understanding of architecture's role in the development of communities is generated. The research problem sets out the direction the research will follow in order to investigate current issues of centralized development. Key concepts and theories are discussed to gain a better understanding of how the built environment can take a responsive approach to the generation of 'smart communities' in the context underserved peri-urban locales. Methods and tools that will be used to understand communities – as well as the built environment's contribution to the building of innovative, inclusive and resilient smart communities – will be discussed.

Chapter two:

Structured around achieving a responsive architectural strategy for the development of peri-urban communities, the theoretical framework discusses theories that provide a lens to address current issues in the community. These theories further inform the spatial goals for the enabling, integrating and empowering of communities. The spatial goals will then be used to develop the program of the architectural intervention.

Chapter three:

Discussing the concepts for the design, tectonics, technology and technique, this chapter will explore the relationship between architecture and development. An architecture that will encourage sustainable development will be motivated and discussed ultimately exploring the contextualized application of tectonics, technology and technique in architecture and its positive effect on the user and the community

Chapter four:

The theories and concepts developed in the previous chapters will be used to identify and discuss relevant precedent studies which will inform the architectural intervention.

Chapter five:

The community of Welbedacht will be explored as a case study: this includes the people and existing facilities. Studied through a responsive architectural perspective, the social conditions of the community will be investigated through existing data and interviews with organizations working in the community. Observations and questionnaires will be used to gain a better understanding of current conditions and the residents of the community.

Chapter six:

Presenting the research and findings, this chapter will identify observations made as well as information gathered through interviews. Recommendations and drivers for a Tech Hub in Welbedacht will be presented so that the design could perhaps be developed to encourage a generation of sustainable and smart communities.

Chapter seven:

The final design report aims to conclude as a final context-specific product of the research, displaying the key design driver and recommendations identified for sustainable development.

1.1 RESEARCH BACKGROUND

1.1.1 INCLUSION OF TECHNOLOGY

Addressing the issue of urban exclusion, the adoption of technology in community architecture provides easily accessible forms of education, skills, resources and healthcare to populations that do not have access to modern facilities. "Technology is not only access to the Internet – it is a micro-finance, health, communication and educational tool; moreover, it provides marginalized people living in slums a way to tell, document and share their stories with others" (Gillette, Eileen, Linda Ham and Daniel Pringle, 2016, Pg. 02)
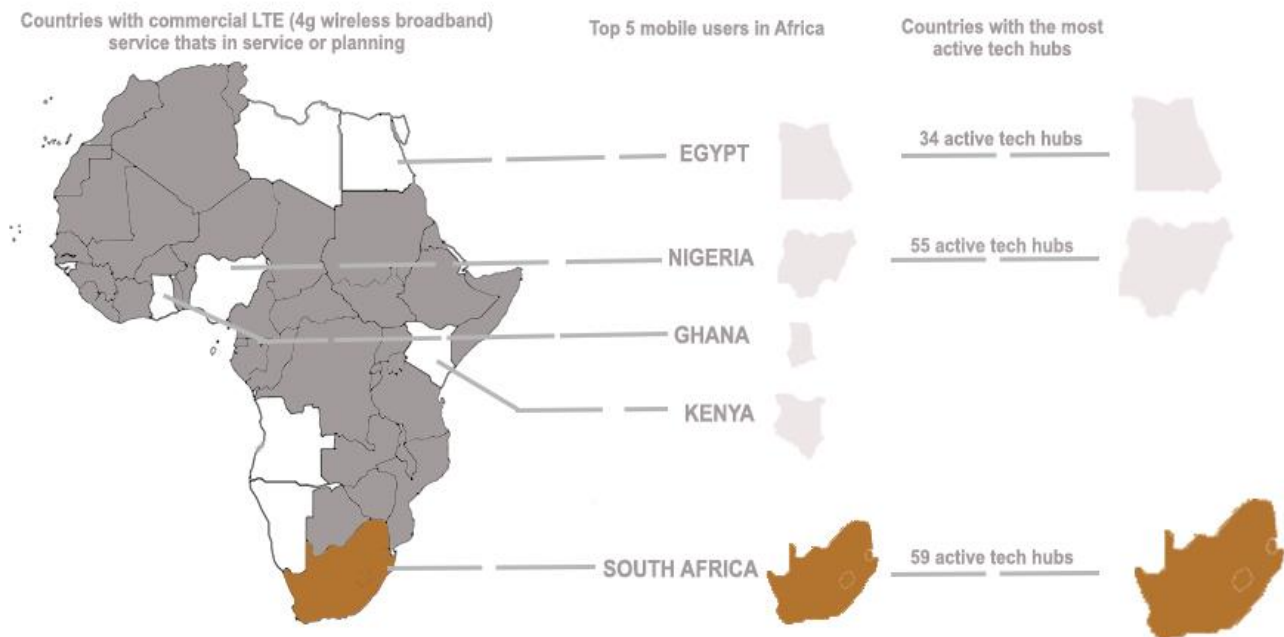
FIGURE: 1.1.1: *A map of Africa showing countries that are at the forefront of technology (Illustration by author, 2018)*

South Africa, highlighted above in Figure 1.1.1, is one of the top five of the eight countries that have the most mobile users in the continent and is at forefront of technology in Africa (Rossman.B.F, 2011). Trending across developing cities, Smart city interventions such as tech hubs can be seen as a solution to issues of social exclusion and a generator for the national development.

One of many tech hub interventions in Africa, The Winch Energy and iWayAfrica solar kiosk (figure 1.1.2) is located in the rural parts of Uganda. The kiosk allows community member from remote villages and communities to connect to services, businesses and resources across the country. A pilot project for a larger project of 250 hubs that will provide villages on the grid with services such as wi-fi, electricity and water pumping facilities, this intervention aims to accelerate rates of economic and community development. (Winch Energy, "iWayAfrica announce The Winch Hub", 2018)

FIGURE 1.1.2: *Winch Energy solar kiosk.*

(Winch Energy, iWayAfrica announce The Winch Hub to accelerate energy and internet access in rural parts of Uganda ,2018)

1.1.2 LOCAL SITUATION: PERI URBANISM

Geographically isolating non-whites to areas on the outskirts of the city, the Apartheid planning model aimed to segregate South African cities. Areas in the city center were reserved for whites only while areas on periphery were allocated for non-whites. Communities on the outskirts were provided with substandard services and were excluded from the developments of the city. Through the unequal distribution of facilities and opportunities and the centralization of development, the apartheid planning contributed greatly to the inequalities experienced in peri-urban communities today. These include high levels of poverty, insufficient infrastructure, lack of facilities, stagnant development and social and economic exclusion.

Furthermore, since the fall of apartheid in 1994, liberalization and democratization have caused an increase in migration from rural areas towards urban areas by people in

search of opportunity and a better life. "*Peri-urban areas within the outskirt of South African cities have received the brunt of the 'invasion' with a rapid rising of large informal settlements, accommodating a multi-cultural variety of people living in sub-standard conditions*" (Macagnano.E.V,2002, Pg 158)
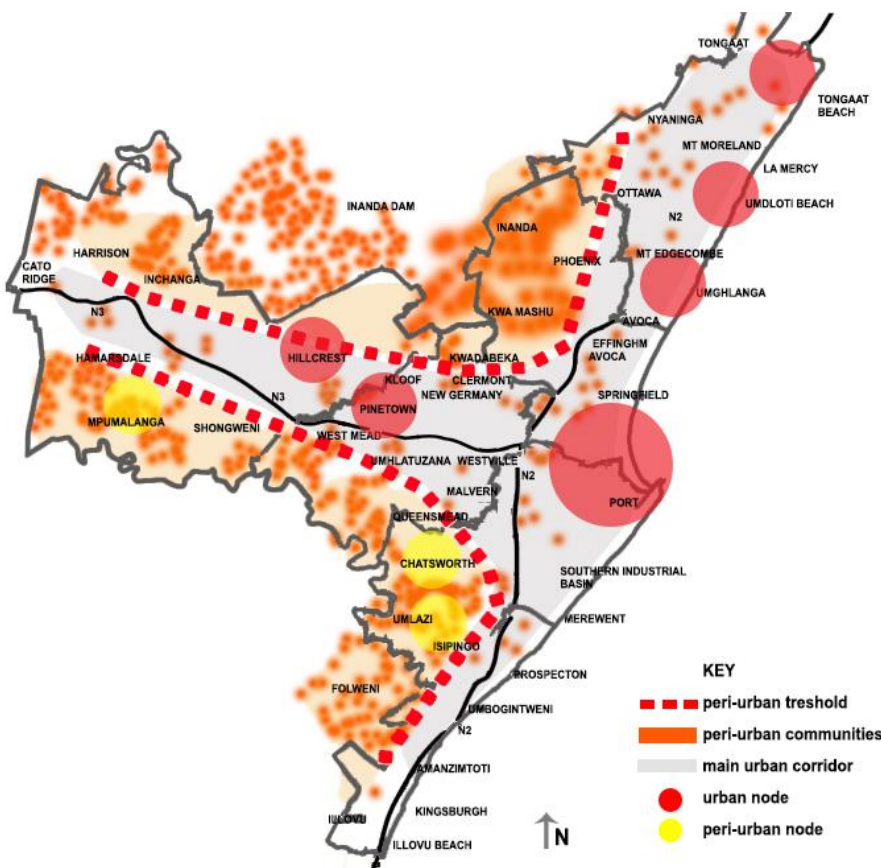
FIGURE 1.1.3: *Map showing peri urban communities in Durban (illustration by author, 2018)(information obtained from Sokhela.S.C, 2006)*

In Durban, peri-urban areas can be identified along the threshold between the CBD and the immediate surrounding suburbs and rural areas outside the urban development line. The map in Figure 1.1.3 indicates the peri urban communities (orange) which are disconnected from the urban core(grey) resulting in problems of accessibility to social services which are predominantly located in and around the CBD and developing nodes

While some peri-urban communities have developed into urban nodes, other areas with less or no facilities remain undeveloped and underserved. Disconnected from the city and its development, these communities often lack basic services and opportunity to progress.

1.1.3 THE CASE STUDY OF WELBEDACHT

Located 22.5 km south of Durban, the community of Welbedacht lies between Chatsworth West and the Umlazi township. Densely populated with informal settlements and low-income housing, the area was identified to be part of the municipal Slum Clearance Programme in 2004. Due to its peripheral location, transport services and facilities such as schools, clinics, police station, churches and shops are either scarce, or non-existent in the locale. Although the area consists of approximately 7311 households, due the lack of facilities in the locale, residents commute long distances to work, the city or facilities in surrounding developing areas.(Sokhela.S.C, 2006) (StatsSA, 2011).

FIGURE 1.1.4: *A map of Durban in Figure 1.1.4 below shows the location of Welbedacht in relation to the CBD, Chatsworth and surrounding facilities*
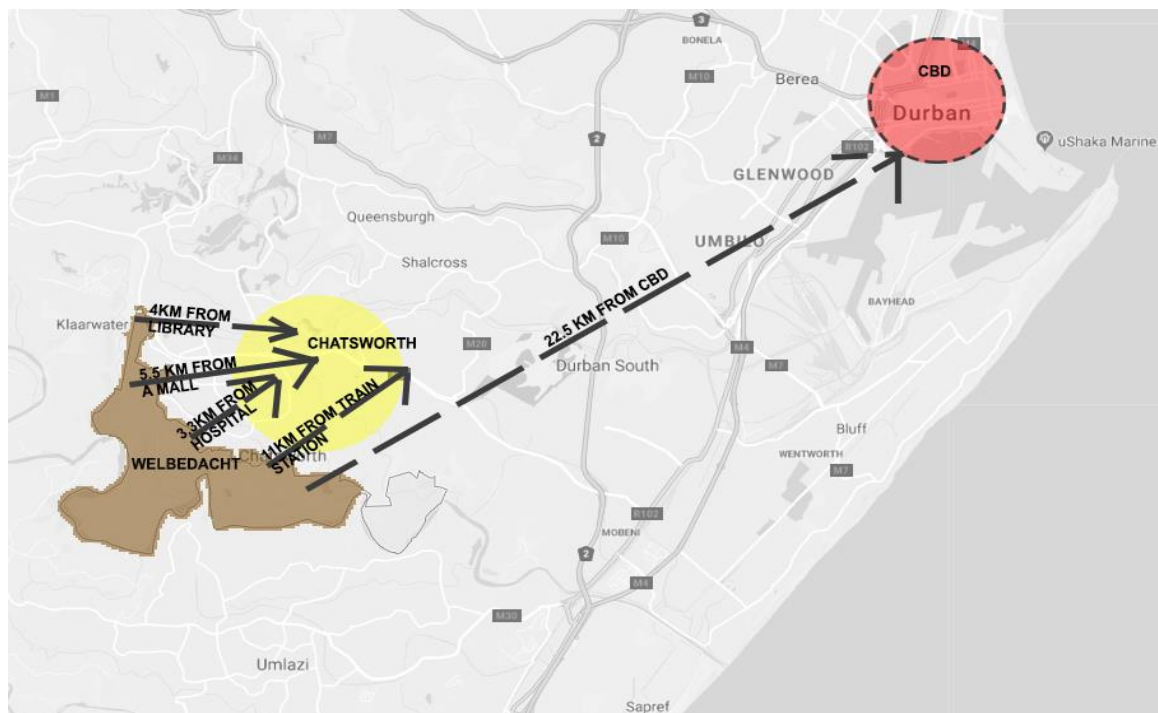
(Google Maps, 2018, Edited by author, 2018)

Narrow roads with little or no pedestrian space are the only access point in and out of the community. There are no formal pathways or public transport systems. Unit 7 in Chatsworth, which is a 3.3 km walk from Welbedacht, is the closet access point for residents to public transport. Travelling on foot from Welbedacht to Unit 7 in Chatsworth will take 38 minutes and an average trip to the city from Unit 7 via taxi will take over 48 minutes.

Geographically isolated the community of Welbedacht has failed to develop due to their lack of resources, opportunities and facilities. In an EThekwini seminar held in March 2014, community members raised service delivery issues that needed urgent attention. Some of the issues raised were basic services such as libraries, community spaces and police stations. (Mthetwa, 2014)

This community was selected as a case study for peripheral communities that do not have access to the advantages of urban living, such as economic opportunities and social networks necessary for progress and development. The approach to design will be informed by research and contextualized to the identified community (Welbedacht).

1.1.4 THE ROLE OF A DEVELOPMENTAL STATE

A developmental state makes use of state resources to develop communities and improve the lives of the people. The government is involved in both the macro and micro economic planning of the country with a main aim to grow its economy and tackle poverty. "*At the heart of a successful developmental state is a mix of interdependent conditions: an effective state, the presence of key institutions, their inter-arrangements and mix, and their relationships with the market and civil society, including business, organized labour, communities and citizens.*" (Gumede, 2013)

In order for a country to become a developmental state, it needs to balance its social and economic growth, revitalize civil society and enable and empower its citizens. By introducing resilient developmental strategies and interventions in underdeveloped peri-urban communities that connects them to the rest of the city, citizens and

communities can be included in development of the city through access to social services, city resources and municipal offices, inconsequential of geographic location.

The National Planning Commission of South Africa offers advice for future plans and investments playing a vital role in the development of the country. In a document drawn up on 9 June 2011, the commission used the case study of a typical 18-year-old girl in order to explain the context and need for change in strategies. (National Planning Commission, National Development Plan Vision for 2030, 2011)

Example:
"Thandi, an 18-year-old female, and her life chances after she had completed matric in 2010.

- There was a 13% chance that Thandi would get a pass to enter university. However, being an African female, for Thandi the chance of getting a university pass was actually 4%.

- Assume that Thandi passed matric but did not go to university. Her chances of getting a job in the first year was 13% and within the first five years out of school was 25%.

- The chances of earning above the median income of about R4000 per month were 2%. Chances were that Thandi would not get a job in the five years after school and that she would receive periodic work for a few months here and there.

- Chances were that Thandi would remain below the poverty line of R418 per month for her entire life until she received a pension."

  (National Planning Commission, National Development Plan Vision for 2030, 2011)

Advocating change in strategies from simply providing housing to strengthening communities, the National Development Plan (2011) recommends that:

- improvements in public transport

- creating employment in townships

- upgrade resources in informal settlements

- increase and encourage security especially in rural areas

- address the fragmentation of urban spaces

Being passive recipients of government services does not allow or encourage the building of active citizen participation or the expansion of capabilities. While housing is seen as an urgent need in poor communities, individuals have taken to providing their own shelter driven by the basic need to survive. Using funds to subsidise the improvement of an individual's house or shelter leaves public spaces in such settlements ignored. (Fourie, D.J., 2001, pg 216-233)

Recognizing this, the Commission identifies the need to develop public infrastructure and community spaces in order to improve the quality of life of public of poor communities. In order to achieve the goal of a developmental state, all citizens should have access to public infrastructure to enable the development of both their community and their individual initiatives. (National Planning Commission, National Development Plan Vision for 2030, 2011)

1.1.6 OPPORTUNITY FOR DECENTRALIZED DEVELOPMENT

FIGURE 1.1.5
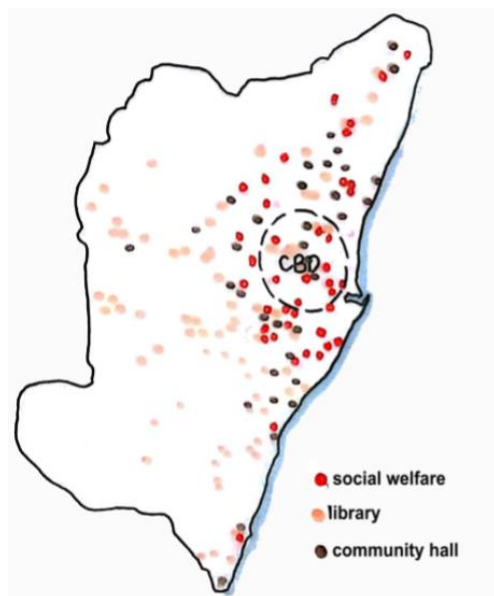*Positions listed are social development facilities in Durban as indicated on the EThekwini Municipality Maps (Illustration by author, 2018)*

While areas in and around the CBD are densely populated with facilities, areas on the periphery of the city have little to no listed government social welfare facilities. Evident in Figure 1.1.5 is the lack of social development facilities in peri-urban communities.
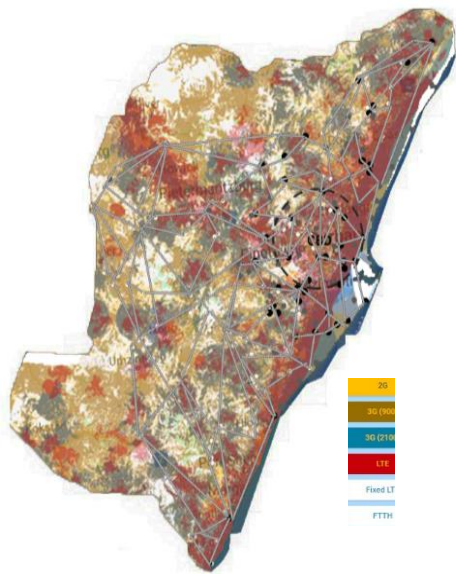
FIGURE 1.1.6
Map of mobile network coverage in Durban and predicted network opportunities for social facilities (Illustration by author, 2018)

The map in Figure 1.1.6 showing the network coverage in Durban indicates that almost every part of the city has network coverage. This presents an opportunity to connect the facilities and the larger urban environment through mobile networks/information connection technology.

Adopting a networked smart community approach to connecting community to facilities and resources offers a decentralized approach to development. In allowing opportunities for active citizen participation by providing communities on the periphery with the technology needed to connect/participate, this approach allows for peri-urban communities to be connected to the development of the city, facilities in the CBD, city resources such as library materials, new methods of construction, networking opportunities, a voice in governance, etc.

1.1.7 MOTIVATIONAL RESPONSE FOR RESEARCH

With a duty to unite the nation, the ANC developed the Vision 2030 and the National Development Plan, which provide a foundation and guideline for the new phase and aim in becoming a developmental state. The National Development Plan, which is based on the visions of the Freedom Charter and Constitution, aims to unite the country, address injustices of the past, improve the quality of life of citizens, tackle problems such as poverty, unemployment and inequality, as well as grow the economy of the

country to the benefit of all its citizens. (National Planning Commission, National Development Plan Vision for 2030, 2011)

Proposing an intervention within underserved peri urban communities, the study aims to create opportunities for progression within the locale by allowing sustainable urban transformation. Evolving from sustainable urban development, this approach encompasses smart governance, innovation solutions, increased opportunities, and lifestyle improvements.

While highly developed areas may already have infrastructure that needs upgrading, underserved areas can save time and resources by 'leap-frogging' outdated facilities and systems, thus making the intervention cost-effective. The underdevelopment of the underserved peri- planning urban areas makes it ideal for an intervention and an ideal target group for information technology development as a response to current problems of disconnection and lack of infrastructure.

With a need for architecture that facilitates and encourages the development of the collective urban environment, this proposal aims to generate a bottom up approach that revitalizes, empowers and links isolated communities on the periphery. The research investigates a decentralized national development approach through a system of linked tech hubs that provide access to resources and encourage active participation.

Unless prompted, supported and skilfully facilitated, these resources are unlikely to emerge as positive forces or result in social progress. Through investigating and exploring the social environment, this study will investigate how built environments can be designed to encourage social change and bring together communities. This form of development does not only benefit the government but improves the life of citizens by supporting the progress of both the individual and community.

1.2 DEFINING THE PROBLEM: AIMS AND OBJECTIVES

1.2.1 DEFINITION OF PROBLEM

Primarily a consequence of the Apartheid planning system, peri-urban communities in Durban are characterized by their lack of social services, infrastructure, pollution, large areas of informal settlements and disconnection from the city. The unequal access to resources, lack of opportunity and high levels of poverty leaves the communities on the periphery socially and economically unequal to those residing in Durban's city centre and suburbs (Sim, Sutherland and Scott, 2014)

While the immobility and isolation of the community can be solved by providing transportation infrastructure, this top-down approach does not address the issue of centralized development. With little or no social development spaces, communities on the outskirt have little or no opportunity to progress, resulting in stagnant development. While government strategies focus on providing housing to poor communities on the periphery, the need for social spaces is often ignored. The failure to provide such spaces restrict positive interaction and the building of social capital within the community.

1.2.2 PROBLEM STATEMENT

The problem statement of the research is thus:

Geographically isolated, peri urban communities lack facilities and opportunities for progression and social cohesion. This, together with social inequalities, affects the community's morale and ability to improve and empower themselves within their locale, thereby hindering its development and growth.

1.2.3 AIM OF RESEARCH

The aim of the research is to inform a responsive architectural strategy to achieve a transformative change in underserved peri-urban communities. Informing and motivating smart and inclusive communities, a relationship between social environment and the built environment will be explored thereby promoting public spaces as a generator of sustainable development.

1.2.4 OBJECTIVES

The objectives of this study are:

1. To understand how architecture can instil a sense of belonging and community pride through the design of environments that encourage social cohesion and collaboration.

2. To investigate what is needed to build a more inclusive and smart community.

3. To inform and motivate architecture that promotes resilient and sustainable communities.

4. To encourage the sustainable urban transformation of the collective urban environment.

1.3. THE SCOPE

1.3.1 DELIMITATION OF RESEARCH PROBLEM

The research will explore the built environment's role in connecting and empowering communities and promoting spaces of interaction, learning and innovation.

Although the design may be influenced by common issues experienced by peri-urban communities in South Africa, the community of Wellbedacht will be the main focus. Factors that are not the key focus of the research but influence the design will be mentioned in the document. Transportation and infrastructure can be proposed as a solution to the immobility of peri-urban communities, however the research focuses on a virtual mobility alternative.

The main focus of the research is to inform the design of a Smart Community Tech Hub that will aim to use advancement in technology and the built environment to empower and integrate peri-urban communities into the developing urban fabric of the city and surrounding /areas

1.3.2 ACRONYMS

ICT: Information Communication Technology

CTC: Computer Technology Centers

C2C: Cradle to Cradle

1.3.3 DEFINITION OF TERMS

smart community: "*a community ranging from a neighbourhood to a nation-wide community of common or shared interest, whose members, organizations and governing institutions are working in partnership to use information and communication technologies to transform their circumstances in significant ways*" (Lindskog, Helena, 2004)

Underserved communities (underserved population): "*The term "underserved population" means a population of individuals, including urban minorities, who have*

historically been outside the purview of arts and humanities programs due to factors such as a high incidence of income below the poverty line or to geographic isolation" (Appendix, Budget of the U.S. Government, Fiscal Year 2014)

virtual mobility: "*Virtual Mobility is a form of learning which consists of virtual components through an ICT-supported learning environment that includes cross-border collaboration with people from different backgrounds and cultures working and studying together having, as its main purpose, the enhancement of intercultural understanding and the exchange of knowledge*"
(Home & Away. Coaching exchange students from a distance. Abest-practice manual on blended mobility. Eds. Op de Beeck,Bijnens, and Van Petegem, 2008)

Information Communication Technology: "*ICT, or information and communications technology (or technologies), is the infrastructure and components that enable modern computing.*" (https://searchcio.techtarget.com/definition/ICT-information-and-communications-technology-or-technologies)

Resources: "*Something that is available for use or that can be used for support or help.*" (https://www.thefreedictionary.com/)

Community development: "*Community development is a process where community members come together to take collective action and generate solutions to common problems.*" (http://www.peernetbc.com/what-is-community-development)

Sustainable urban development: "*A process of synergistic integration and co-evolution among great subsystems making up a city (economic, social, physical and environmental), which guarantees the local population a non-decreasing level of well-being in the long term, without compromising the possibilities of development of surrounding areas and contributing by this towards reducing the harmful effects of development on the biosphere*" (Camagni, 1998)

Innovation: Creating; exploring new methods; making use of the available resources to find solutions to meet requirements and needs.

1.3.4 STATING ASSUMPTION

It is assumed that the built environment, together with technology, can play a role in the development and integration of isolated communities. Addressing issues of centralized development can fuel the development of underserved peri-urban communities that have the potential to thrive given the resources needed to improve their community. Assumptions are made that underserved peri-urban communities feel disadvantaged and isolated from progression and the built environment can benefit them by providing an environment designed to allow and encourage social progression and sustainable transformation

1.3.5 KEY QUESTION

What is the role of the built environment in enabling, integrating and empowering communities?

SUB QUESTIONS

1. How can architecture facilitate and encourage social progression and positive transformation within peri-urban communities?
2. What is needed to build a more inclusive and smart community?
3. How can architecture promote resilient and smart communities?
4. How can the built environment impact positively on sustainable urban transformation?

1.4 THEORETICAL FRAMEWORK

The theories selected are studied in an attempt to understand how architecture, can respond to issues faced by peri-urban communities discussed above. Answering the research question "what is the role of the built environment in enabling, integrating and empowering communities?", the theories will inform strategies to improve the three identified areas of the community development, namely:

1. people
2. infrastructure
3. environment

1.4.1 PLACE THEORY

People require a stable sense of places in which to develop themselves, their culture and their social life. (Frampton, 1983; Pallassma, 2005) Since built environments need to respond to both the physical and social context, place theory and the sub-theory of critical regionalism are explored. By making a necessary cultural connection to place, this research will recognise all factors that influence the spirit of place, i.e.: the communities, moods, activities and materials and not necessarily architecture alone. (Day, 2002)

The sub theory of Critical Regionalism will be explored to inform a responsive approach to the existing environments in the community. This theory provides the principles needed to find a balance between the local context and global progression of respecting culture and identity through architecture (Frampton,1983)

1.4.2 A CITY IS NOT A TREE

In his paper "A city is not a tree", Christopher Alexander (1965) examines the social structure of overlapping communities. He argues that by ignoring the overlap in both the social and built environment, design causes further isolation. "*Building ourselves*

into a Tree structure forces unnatural separation of normally intertwined aspects of life" (Alexander.C, 1965).

Forcing segregation similar to the layout of a tree described by Alexander, the layout of the South African cities. during Apartheid era left areas on the outskirts disconnected and isolated.

1.4.3 LOST SPACE

"*Linkage is the glue of the city. It is the act by which we unite all the layers of activity and resulting physical form in the city thus making comprehensible links between discrete things.*" (Trancik.R; 1943: pg 106)

Roger Trannick (1986) defines "lost space" as areas which are isolated from its context and suggest that all spaces should be integrated and linked. Trannick's theory of lost space, can be used both in the macro and micro scale to analyse the movement of people and the relationship between spaces. Combining figure ground, linkages and place to form a defined urban environment, he highlights the importance of arrangement, densities and open space.

1.4.4 SOCIAL-ECOLOGICAL (ADAPTIVE) RESILIENCE

"*The concept of resilience has been used as a conceptual framework in multiple disciplines to evaluate the ability or capacity of a person, object, entity, or system to persist in the face of disruptions or difficulty*" (Laboy and Fannon, 2016)

Translating resilience into architecture requires short-term and long-term thinking. Planning and creating "ways that enable adaptation in the long-term" includes finding thresholds of change and forms of resistance that allow for culturally desired stability in the short term. Providing insight on the lifecycle changes of buildings and material, cradle to cradle theory provides design considerations for long term use. (McDonough and Bruangart, 2003)

1.5 CONCEPTS

The concepts discussed, tectonics, technology and technique were chosen in order to investigate the relationship between architecture and development. Aimed towards answering the key question, 'what is the role of the built environment in enabling, integrating and empowering communities?' the concepts are informed by the studied theories to explores the relationship between the built environment and the enabling, educating and empowering of communities.

1.5.1 TECTONICS

Tectonics addresses phenomenological ideas, solves structural issues and encourages the expression of structure. It offers a relationship between form, structure and the user (Frampton K, 2001). Community development architecture, discussed in a broader tectonic understanding, allows for the development of architectural quality. By considering local materials and constructions methods, tectonics creates an opportunity to empower residents through on-site skills training workshops as well as fosters community bonds through community participation. (Cole, S, 2006, pg89-103)

1.5.2 TECHNOLOGY

Empowering communities technology expands possibilities by introducing new, innovative and sustainable methods of development. Technology can be seen as a catalyst for growth in isolated peri urban communities by providing an opportunity to bridge the gap of social and economic opportunity caused by geographic isolation, through online resources and sustainable off-the-grid solutions.

1.5.3 TECHNIQUE

The introduction of mass production in the industrial age resulted in products available for everyone. With production through machine processes, the traditional and contemporary techniques were lost due to the decrease in craft. "*The machine has become our main source of magic, and it has given us a false sense of possessing god-like powers*". (Mumford.L,2000,pg 137-138) While technology allows for the expansion of skills through knowledge, the technique or the action of doing crafts such

as masonry building, carpentry, woodwork, etc. is a refined skill. The building itself becomes a teaching tool by using and displaying sustainable construction and technology thus teaching users its application technique in construction and through visual learning.

1.6 RESEARCH METHODS AND MATERIALS

This research aims to explore and understand the role the built environment has on the development and connection of communities. The purpose is to use the information obtained to motivate and inform a responsive architectural, smart community intervention that will enable, empower and integrate underserved peri-urban communities, so to encourage social change and the sustainable urban transformation of the collective urban environment.

1.6.1 UNIT OF ANALYSIS

This research will primarily explore issues hindering the development of underserved peri-urban communities in Durban, focusing on the community of Welbedacht.

1.6.2 PRIMARY DATA COLLECTION: INTERVIEWS AND MAPPING

The research aims to explore the role of the built environment in enabling, integrating and empowering underserved peri-urban communities. In order to promote sustainable urban transformation as a development strategy for the city of Durban, the three clear areas of data collection are as follow:

The first focus is a questionnaire with members of the selected community, Welbedacht. This information aimed at gathering information on the facilities needed and how architectural intervention can help improve the development of their community

The second focus will be on mapping community facilities in and around the city to investigate the services they provide. The data collected will be used towards motivating for the networking of facilities that will benefit all communities.

The third focus is focused interviews with professionals involved in outreach community development programs that use technology to uplift and connect communities. This research is critical in gaining insight on the response of communities to such interventions and lessons learnt from previous projects. This information will help leap frog issues that can only be learnt from first-hand experience in such projects

1.6.3 SAMPLING METHOD

A snowballing sampling method will be adopted in order to approach community members. Although most of the community members are friendly, a sample connection will be made through an existing known source who is a member of the community. This will allow for a non-abrasive approach, making sure the community member does not feel interrogated and a conversation around the interest and perceptions of the community and its development is initiated.

A larger network of connections will be established from this connection. Anonymity of the samples will be kept with the use of pseudonyms where necessary and discussed with the sample.

The estimated sample number will be around 10-20 people in order to understand the role of the built environment's role in the development and connection of the collective urban environment and its benefit to underserved peri-urban communities. An age gap of 20-50 years will be used due to the fact that the older samples have experienced life in the community and travel to the city.

1.6.4 CASE STUDIES

This section will focus on the area of study i.e.: Welbedacht, South Africa. Interviews with community members and organisations working in the community will be undertaken and observations will be made of the community and existing conditions. This study will allow for a comprehensive understanding of the existing environments, services, architecture and construction skills.

1.6.5 SECONDARY DATA COLLECTION: LITERATURE AND PRECEDENT STUDIES

Exploring various literature and media by various authors, secondary information will be attained. This will form the majority of the dissertation which informs a series of motivation for the need of tech hubs within peri-urban communities

LITERATURE REVIEW

The literature review will aim to gain further information on the relationship between the built environment and sustainable development.

In order to encourage and enable sustainable development and progression in South African peri urban communities, the literature review will be divided in to two chapters that inform the approach and design of a Tech hub in the identified peri urban community (Welbedacht).

The first chapter applies theories: Place theory, Linkage theory and Social Ecological Resilience theory as lenses to address current issues within the community. The concepts of tectonics, technology and technique in the third chapter aims to improve the living conditions and opportunities within peri urban communities by informing the spaces and architecture needed to facilitate, enable and encourage sustainable urban development.

Literature obtained from journals, books, electronic data and academic papers as well as national and international precedent studies will be discussed in the research. The literature, aiming to gain an understanding of the relationship between the built environment and sustainable development, will firstly be discussed at a broader scale of South African peri-urban communities and then focus on the particular identified community of Welbedacht in the chapters to follow.

1.7 CONCLUSION

Highlighting the process of developing the architectural intervention, this chapter emphasises the need for the process of the design and the built environment to be community-engaging. Taking a bottom up-approach, the people of the community and the built-environment are to co-exist and not seen as separate elements.

It was established that peri-urban communities such as Welbedacht, are suffering due its geographic isolation and lack of facilities and resources. Struggling to find opportunity to progress in the community, residents travel far distances for employment and resources. With no opportunities to progress within the locale, the development of the community is stagnant.

The parameters of the theoretical and conceptual framework and methodology to be followed has been set along with the research. The theoretical framework explored in chapter one will establish the programme of the intervention while the architectural language and form will be explored in the preceding chapter.

Chapter four and five will explore relevant precedent studies and the case study of Welbedacht respectively. Following that, chapter six will present the findings of the research together with the recommendations of drivers and key principles that will inform the design of the Tech hub.

CHAPTER 2

THEORETHICAL FRAMEWORK:

CHAPTER TWO

THEORETHICAL FRAMEWORK

2.0 INTRODUCTION

in the previous chapter was the problem of Apartheid place-making trajectories and its scars left behind in underserved peri-urban communities. In light of the highlighted issue and the rich history of segregation and inequality of South African communities, it is integral that architectural intervention in these communities are accessible to all.

The high rates of unemployment and the stagnant development of these communities is a major concern that needs to be addressed, as it sows the seed of social and economic inequality. For architecture to be meaningful in a context of a previously disadvantaged community, its objective needs to be to bring about social change. With the right resources, education and environment it is believed (by the author) that the challenge of stagnant development can be overcome.

Identified below, through background research and field work, are the three current contributors to social and economic inequality in peri-urban communities:

1. lack of social capital
2. isolation
3. degradation of environment

The theories presented in this chapter is an attempt to understand how architecture, responding to current scenarios listed above, can act as a social agent for change to help enable, integrate and empower underserved peri-urban communities. Answering the research question "what is the role of the built environment in enabling, integrating and empowering communities?", the theories will inform strategies to improve the three identified areas of the community development, namely:

4. people
5. infrastructure
6. environment.

Place theories are applied to understanding people, Linkage theories are applied in order to understand the needed infrastructure, and theories of Socio-Ecological Resilience is applied in order to understand design principles needed to achieve a holistically responsive architecture. Unilaterally connected, the theories will be applied so that connection between the theories provide a design strategy for sustainable development of smart peri urban communities.
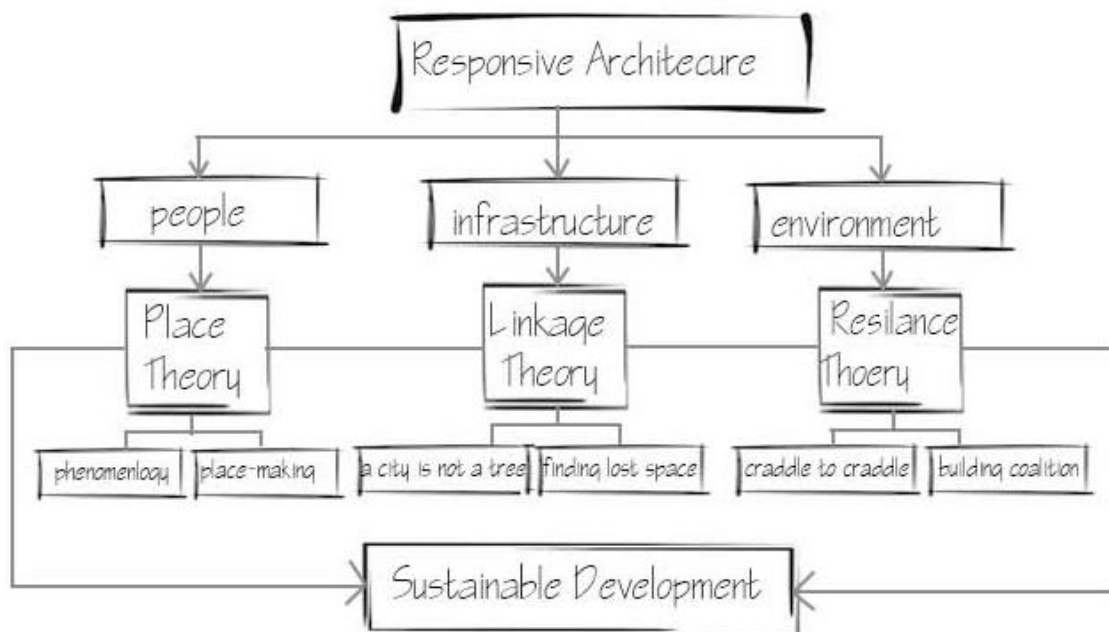

FIGURE 2.1 *A diagram linking the theories applied to the three areas of community development (by author, 2018)*

2.1 RESPONSIVE ARCHITECTURE

The study of responsive architecture presents opportunities to address issues within the community space as a medium or a process to achieve the desired outcome of community growth and development. Buildings are often designed to be unchangeable and rigid objects, however social and environmental conditions often change. Although communities form naturally, integrating strategies through the built environment allows for communities to reach their full potential, thus fostering and encouraging sustainable development.

As a point of departure for exploring strategies for the development of communities, in their book "Cultivating Communities of Practice: A guide to Managing Knowledge" authors Etienne Wenegr, Richard McDermott and William M. Snyder (2002) emphasize the need for interactive and "alive" communities. Criticizing the isolation of natural communities that fail to grow beyond a circle of friends and the failing of international communities that fall apart due to their lack of vitality, they suggest that inviting and encouraging interaction is the key to keeping communities "alive."

Using the example of a park, they argue that a park is more appealing if it is a short-cut between two destinations rather than an isolated destination. Adding a bench slightly offset from the main path, near a bed of flowers or in a spot that receives sunlight, invites people to sit during lunch time or have a chat. This suggest that the organization of spaces invites interaction. A well-designed community space will have a larger gathering space allowing for group discussions and participations. Although communities can be said to be organic, design evokes and invites interaction and aliveness. (Wenger, E., McDermott, R.A. and Snyder, W., 2002)

Concluding in a design strategy that fosters sustainable community development, the authors identify the following seven principles for the "cultivating of communities":

1. **Design for evolution**

   A catalyst for the natural evolution of communities, design elements do not create communities from scratch but further supports the organic development of it.

2. **Open dialogue between inside and outside perspectives**

   Good community design brings in perspectives from the outside through networking and dialogue.

3. **Invite different levels of participation**

   Community participation is the heart of community development however not everyone has the time or wants to contribute on the same level. Passive contributors on the side-lines give valid input and therefore, rather than forcing participation, opportunities for participation should be introduced, keeping all members connected

4. **Develop both public and private community spaces**

   The heart of the community is its relationships. Although community design focuses on fostering bonds through public spaces, the in-between and informal cohesion spaces should not be ignored. The key to designing good community spaces is acknowledging the interrelation of private and public spaces, allowing the orchestration of activity in both spaces.

5. **Focus on value**

   Not always apparent at the formation of the community, the value of the community grows as the community itself grows. Strengthening relationships and creating events and activities increases the value of community by encouraging community members to have positive impacts on their community.

6. **Combine familiarity and excitement**

   Offer the familiar comforts of the context but also allow for a variety of events to encourage new ideas and bring people (visitors) cycling into the community. Combining familiarity and excitement fuels engagement from the community.

7. **Create rhythm and excitement**

   Indicating its aliveness, the rhythm of the community is created by events, interaction, flow of people, informal activity, active participation and the communities' overall evolution (Wenger, McDermott and Snyder, 2002)

The factors that affect the development of a community can be divided in various components, however, for the purpose of the research, it is divided into three identified phases of development: people, infrastructure and environment. The design process and implementation at these stages will be explored through the lens of architectural theories of place, linkage and resilience in order to find the key relationship between community development and the built environment.

2.2 PEOPLE: PLACE THEORY

Although many argue that it is not the architecture that creates the community but people, the built environment sets the stage for the fostering of communities. Recognising the importance of the connection between people, place and identity, the built environment should encompass a relationship between all. "People", being the first identified element of development, make up the community. In order to understand a community, it is important to understand its people, their background, their needs and their culture. Translating it into a physical manifestation, responsive architecture, being place-bound should be seen as something that connects people to the site, the community and its diversities. Place binds human and cultural activity by forming a centre for activity and participation. Architecture, through capturing the place in which it is in, creates a relationship between the built environment and people (Day: 2002; 164).

'

Over the years many theorists have studied 'place': Heidegger (1973) wrote about the relationship between place and our mind, body and outside world; Relph (1976) spoke of a sense of place and placelessness; Tuan (1977) discussed the difference between topophilia and rootedness; Posnanski et al (1978, 1983, 1987) and Hull et al (1994) looked at place identity and Altman and Low's (1992) place attachment theory. While all of the above were significant milestones in the research of place, there has been is no single definition of 'place' by theorists.

'Place' in architecture is often associated with genius loci, which is known as the "spirit of place". (Schulz.N, 2000) According to Roman belief, each human has a guardian spirit known as 'genius'. This spirit gives life to people who then give life to place. (Schulz.N, 2000) Embodying the interaction and dwelling of people, the design of a place should be human- and community-centric. When finding a relationship between the behaviour of people and 'place', it is important to acknowledge the physical constraints of the built environment and its supportiveness of social behaviour. The architecture therefore needs to capture the essence of the community and supports its growth. Describing the concept of community as "*complex*", Dewar, in "South African

Cities – A Manifesto for Change", explains that "*in essence, it relates to creating a sense of identity and belonging – a sense of absorption into urban life*" (Dewar, 1991,pg 21).

In order for architecture to establish a sense of belonging and community, it needs to be bound by principles of place-making and critical regionalism. While the first fosters a relationship between people through the creation of positive social environments, the latter keeps the architecture responsive to the "place" by creating a sense of belonging

2.2.1 PLACE-MAKING

Dovey (1985), states that "*place is a concept that spans the scales of human environment interaction from the armchair to the planet*" (Dovey, 1985, pg 93) In relation to his research, the 'armchair' described by Dovey can be associated with the individual and the 'planet' with the community. This relation is important to the findings of this research to provide insight into the development of both the individual and the community. Dovey (1985), acknowledges the connection between people and settings and encourages the use of participatory place-making to develop this relationship. Dependent on the quality and experience of the place, a 'sense' of place (according to studies in psychology) is created by a sense of community and helps members to achieve positive self-definition by allowing them to feel part of a larger structure. (Sarason, 1974).

A positive environment fosters the reinventing and revitalizing of the community culture by breathing a new life into the distressed communities. Creating a sense of community in essence *is* place-making. (Richardson, A., 2015) With the power to transform and revitalize the locale, creating a sense of place improves the quality of life in the community.

The factors contributing to the experience of a place can be separated in two groups: the cognitive factors and the physical characteristics of a space. Referring to the meaning an individual links to a place, the cognitive factors vary according to experience and the relation or emotional bond that forms towards a place. The physical

attributes of a place do not only define and contribute to the setting of a place but add to the meaning. Factors such as scale, proportion, texture, colour, distance and diversity support actions and activities and influence the identity and social dynamism in the community. (Lakah.Y, 2015).
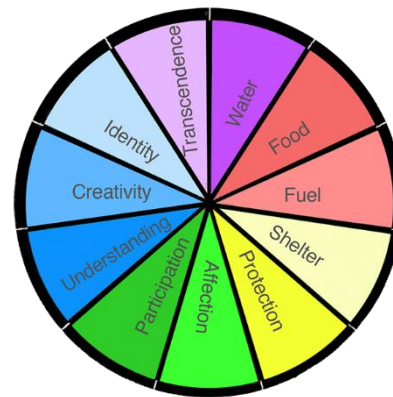

FIGURE 2.1.1: *Maslow's hierarchy of needs (https://www.psychestudy.com)*

FIGURE 2.1.2: *Max Neef's wheel of fundamental human needs (http://www.chrischesneau.com)*

Used to understand the intangible/cognitive layers of positive social spaces, Abraham Maslow hierarchy of needs (figure 2.1.1) indicates the five needs that motivate human behaviour. Placed in a sequence, Maslow's model implies that humans start achieving their needs from the bottom up, starting from basic needs such as physiological needs and safety, to higher level needs such as self-actualisation. However, Max Neef's wheel of fundamental human needs (figure 2.1.2) suggests that needs share a relative relationship. Having a socialist background, Neef's theory of fundamental needs encourages a holistic approach to social development by acknowledging the overlapping of human needs. Architecture, like Neef's wheel, should not restrict communities to just the needed provisions, thereby allowing for the overlapping of spaces that creates a catalyst for the building of social relationships (Lakahn, 2015).

The built environment is then created by a system of overlapping and inter-connected spaces that responds to the various needs. These overlapping spaces is where social cohesions take place.

From a sociological perspective, in order to enhance the built environment to foster social relations, it is important to understand how people respond to architectural forms and how they can be used to create meaningful spaces. Although human behaviour in a place can't be accurately determined and controlled, the built environment provides the tangible physical structure that facilitates the intangible. In this case, it is human behaviour.

In order to address the injustices of the past, there is a need to create new dynamic spaces in South African peripheral communities. This would foster positive identities and development. Applying place-making principles in the context of South African peri-urban communities requires understanding its history. Although South Africa is twenty-four years free from Apartheid rule, place-making trajectories of the past have left behind scars in the form of economic and social consequences in peripheral communities. Spatial fragmentation, inequality and socioeconomic exclusion are still present in cities today. Looking forward towards a new era of the country which can be characterized by principles of democracy, freedom and reconciliation, there is opportunity for communities to share the same social space. Diverse culture mixing together to form a common identity is one that represents the uniqueness of multi-cultural South Africa. (Freuh, 2003)

Enabling the fostering of a sense of community and positive identity in these communities, the built environment through physical space offers an opportunity to create a supportive environment that encourages interaction and community pride. While the tangible response to addressing injustices of the past would be providing a community facility, intangible needs to encourage social inclusion can be addressed through the designing of inclusive dynamic spaces which embodies the essence of multi-cultural communities.(Richardson, A., 2015)

Applying principles of place-making in architectural design together with modern technology to create cohesive environments encourages social inclusion on both a macro and micro scale. (Shannon, K. and Smets, M., 2010) With the potential to act as a key public space, Community Technology Centres (CTCs) and place-making tools

provide catalyst for change within low-income areas. Although not commonly viewed as social spaces, CTCs provide the benefits of good public space such as:

- Increasing the local economy
- contributing to the creation of a positive community identity
- promoting social interaction
- including the diverse population
- improving and allowing accessibility to resources
- increasing participation in civil society
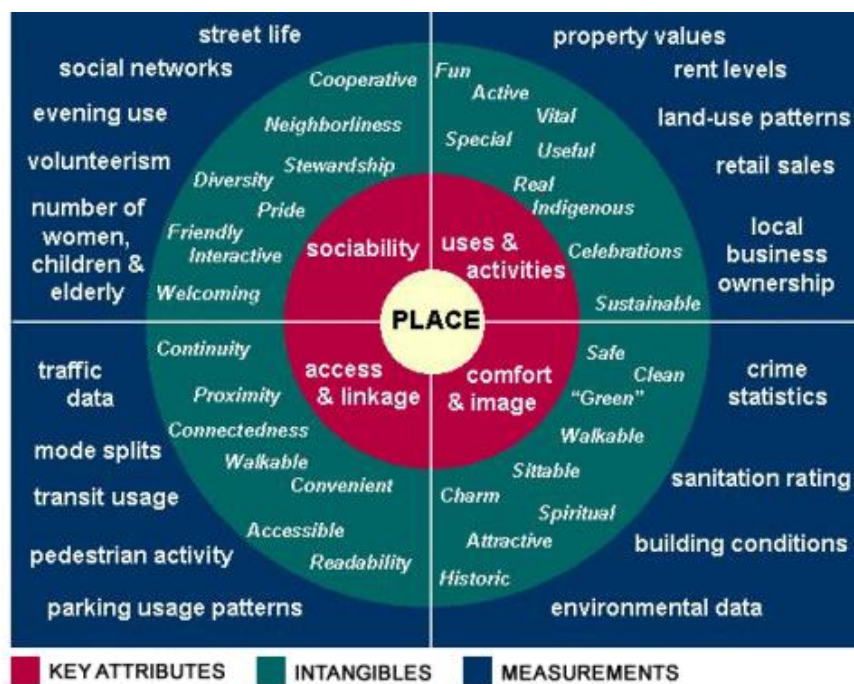- encouraging community activism

FIGURE 2.1.3: *Place diagram developed by "Project for Public spaces" as a tool to help people understand factors that make a "good" public space (https://www.pps.org/)*

Through evaluating public spaces and communities around the world, *Project for Public Spaces* in the place diagram (figure 2.1.3) identified tangible and intangible attributes that contribute to the creation of 'good liveable spaces.' While the importance of attributes varies according to the socio-economic, political and living conditions, the presence of the four main attributes (sociability; uses and activities; access and linkages; comfort and image) creates good public spaces. (https://www.pps.org/) Apart from this,

community spaces need to respond to the existing context, culture and environments of the locale.

2.2.2 CRITICAL REGIONALISM

Concerned with the connectedness of place, the theory of critical regionalism aims to find a balance between regional and universal approaches and design. Kenneth Frampton, a 21st century theorist known famously for his development of architectural phenomenology states that "*Critical Regionalism necessarily involves a more directly dialectical relation with nature than the more abstract, formal traditions of modern avant-garde architecture allow*" (Frampton.K, 1983, pg26). In his argument, first introduced in his work, "Towards a Critical Regionalism", he explains that architecture, taking into consideration the social environment, should respond to physical and cultural contexts in order to achieve a sense of place and meaning (Frampton.K, 1983)

This suggest that culture in peri-urban communities - although richly diverse - should be recognized and built upon to find a community identity. Working together to create a comprehensive whole, culture and identity should translate into the built environment so that communities can identify with it. Although it creates a sense of belonging through the built environment, this approach counters issues of placelessness by rooting the design within the context.

However, neither opposing nor proposing the capturing of local traditions, the theory of critical regionalism encourages the cross fertilization of both approaches (Nesbitt, 1996). Responding both to micro and macro environment, a critical regionalist approach encourages finding a balance between local and international trends (Frampton, 1983). While it is important to draw from the context, technological and modernists concepts offer progressive and innovative design solutions. Critical regionalism encourages the built form to support modern architecture while still being relevant to the locality (Day, 2002).

Displaying the cross fertilisation of both approaches, the Scottish Blackhouse incorporates nature and modern technologies together and the vernacular processes of the area allow for the past and future united.

FIGURE 2.1.4: *Scottish Blackhouse (Day, 2002, pg164).*

The Marika-Alderton House, by Glen Murcutt exhibits a blend of modern technology and local context-specific design through environmental response and use of materials. The simple construction of the house allowed for it to be prefabricated and used in other areas.

FIGURE 2.1.5: *The Marika-Alderton House,(https://mgerwing.wordpress.com)*

The ingenuity and creativity of peri-urban communities in South Africa in providing basic shelter (however informal) displays innovative methods to improving their living spaces and conditions. Providing an opportunity to build on the local logic shown by the marginalized urban poor and adjusting to the new social landscape introduced by of the 21st century, technology provides an opportunity to expand the boundaries of creative expression in communities. One must acknowledge the strengths of both approaches by celebrating and encouraging the existing culture through the built form while still supporting progress of the digital world offers. This requires finding a delicate balance. Community-building spaces should ensure social sensitivity and humanization in design; be "homely"; accessible; welcoming and further offer opportunities for individual and community prosperity. Integrating necessary infrastructure and technology and providing this to the marginalized poor in order to

connect and progress not only allows for the development of the community, but also introduces new possibilities and opportunities to prosper

2.3 INFRASTRUCTURE: LOST SPACE

Infrastructure can be defined as "*The basic facilities, services and installations needed for the functioning of a community or society*" (https://www.thefreedictionary.com) Provided with the proper infrastructure isolated communities, which can be seen as "lost spaces" can be connected and integrated into the rest of the urban fabric. Infrastructure is not only limited to road and rail but can also expand to virtual infrastructure.

Not only does technology deepen democracy in communities, it also empowers people to become 'smart citizens' through open-data, social media platforms and interactive platforms. However, engaging citizens goes beyond the uptake of technology; it extends to co-creating ideas and solutions. Creativity and collaboration in peri-urban communities are often limited by the lack of resources and supportive spaces (infrastructure).

Public space serves as an anchor by shaping interest and allowing for the manifestation of social capital and is thus an essential public infrastructure for the shaping and building of communities (Foster, 2013). Architecture - together with technology as a mediator - should provide the necessary spaces, environments and linkages needed to connect communities both on a micro and macro scale.

While public spaces provide physical infrastructure, there are different structures in society, such as governments, businesses, schools and families. Each of these components need to work together for a functional society. Viewing society as an interconnected system, there is a need for communities to be connected to the larger social world. "*A society is a complex system composed of various parts, much like a living organism. Just like the heart, lungs and liver work together to keep an animal alive, so too do all elements of society structure work together to keep a society alive*." (Newman, 2011: 18).

A theory of urban design, Linkage Theory informs methods used to understand the relationship among important spaces and places. (Trancik.R, 1943). Implying the

connecting of the city through lines, flow of movement, building edges and axis, linkage theory involves the understanding of circulation and connection in order to understand the urban structure of a place. *"Linkage is the glue of the city. It is the act by which we unite all the layers of activity and resulting physical form in the city, thus making comprehensible links between discrete things"* (Trancik.R, 1943, pg106).

The second component of community that was recognized was the need for infrastructure. Disconnected and isolated peri-urban communities require necessary infrastructure needed to link both the micro and macro environment. The theories of 'a city is not a tree' and 'lost space' is used as lenses to explore the existing connections between communities and identify linkages, patterns and architectural elements needed to establish a connected, 'semi-lattice' community.

2.3.1 A CITY IS NOT A TREE

In his paper "A city is not a tree", Christopher Alexander (1965) examines the social structure of overlapping communities. He argues that by ignoring the overlap in both the social and built environment, design causes further isolation. "*Building ourselves into a Tree structure forces unnatural separation of normally intertwined aspects of life*" (Alexander.C, 1965).
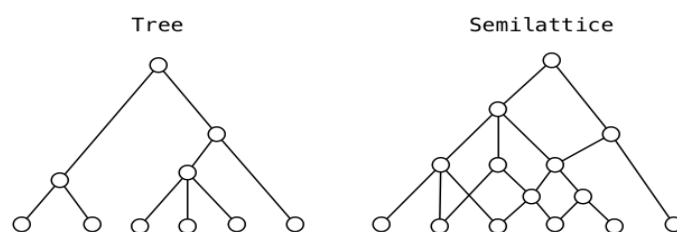

FIGURE 2.3.1*: Comparing the different types of connectivity to a tree and a semi-lattice, Alexander points out that a tree structure forces separation while a semi-lattice recognizes the intertwined relationships (Alexander.C, 1965)*

Forcing segregation, in a similar layout of the tree described by Alexander, the layout of the cities during the Apartheid era left areas on the outskirts disconnected and isolated. T The urban model plan, enforced by the government of the time, aimed for

racial segregation and the socioeconomic marginalization of the blacks (non-whites). Geographically isolated at the periphery of the cities, access to the city for the black population was limited. The need for an intertwined relationship and access to the facilities in the urban core was recognised but avoided in order to create the socioeconomic conditions needed to keep black Africans subjugated. This resulted in social tensions between people living in the urban core who had access to services and those living in peri-urban communities on the periphery. Little development was made to infrastructure and services in areas on the periphery. (Mehrotra, 2012)

Prior to 1994, transport was not handled in a holistic way. Poor and inadequate transport infrastructure meant many South Africans did not have access to economic opportunity and social spaces. The spatial patterns enforced by Apartheid are difficult and costly to be dismantled overnight and this can be seen in the transport infrastructure of the city. (South Africa Department of Planning, Monitoring and evaluating 20 year review, 2014)
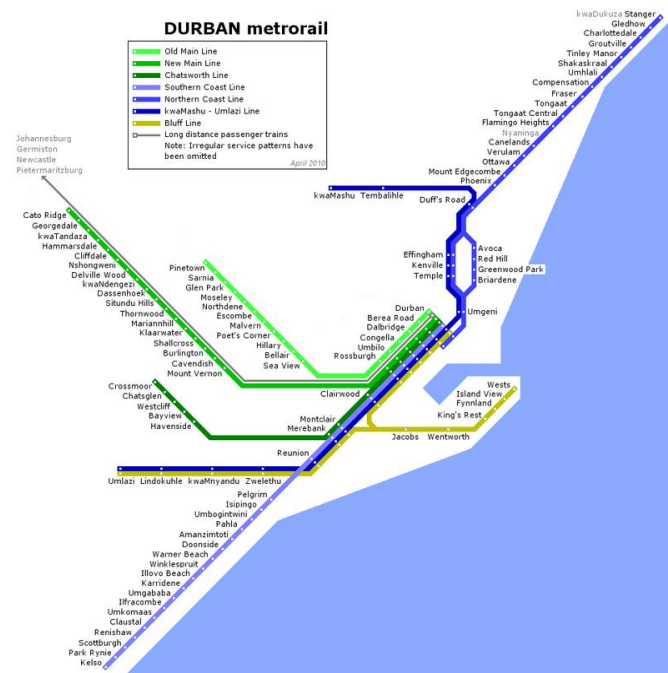
The Metro-Rail Kwa-Zulu Natal services the province by commuting workers daily from the outskirts to the city.

FIGURE 2.3.2:

Metro-rail lines in Durban and its outskirts in Kwa-Zulu-Natal (www.metrorail.co.za/maps)

The metro-rail lines of Durban each reach out to different neighbourhoods. While each person in these neighbourhoods are connected to other neighbourhoods in their line, to access a neighbourhood served by a different line, they first need to travel to the CBD. It can be seen from the unequal number of stops in each train line and its lack of

interconnectedness, that Durban's rail system relates to a tree and all branches are not equal. This system restricts the interconnectedness of communities, keeping all activity in the central urban nodes. This restricted access to other decreases opportunities for communities that are not on the main lines to prosper.

While the car could be presented as an alternative option, this is dependent on access and funds to one. However, the highways of the city echo a similar pattern to the train's tree-like system.

The restricted mobility leaves people living, working and playing along one "branch". While major infrastructure such as railways, stations and highways are not easy to change, the need for semi-lattice of communities to address social exclusion and restricted mobility should not be ignored.

Addressing the injustices of the past, there is a need to create new dynamic spaces in periphery that connect and link communities using the approach suggested by Alexander (1965). Adjusting to the new social landscape introduced by of the 21st century, technology expands the boundaries of the city. This provides an opportunity for the residents, if given access to tools and resources needed to connect and explore possibilities beyond their expectation and offers a balanced approach in empowering communities. Building social relations through virtual mobility in the age of modern communication with innovation as a driver, smart communities offer opportunities to create linkages. Not only does this expand the social environment of communities but improves their access to resources as well. (Anderson, 2014)

Mobilizing social and economic resources, smart communities encourages collaboration, social harmony, better safety and healthy living. With the potential to introduce new ways of engagement, technology creates a portal for communities to develop and connect, thereby encouraging a semi-lattice structure of community relations. Beyond community-centric communication, CTCs connect residents to services, organizations and vital information providing a key for development, empowerment and greater civic participation. While virtual mobility addresses the connections of the macro environment exploring the tangible aspects of linkages and

connectivity, the built environment should create interactive spaces that contribute positively to its surroundings.

2.3.2 LOST SPACE

Roger Trannick (1986) defines "lost space" as areas which are isolated from its context and suggest that spaces should be integrated and linked. Trannick's theory of lost space, can be used both in the macro and micro scale to analyse the movement of people and the relationship of spaces. Combining figure ground, linkages and place to form a defined urban environment, he highlights the importance of arrangement, densities and open space.

Using a figure ground drawing as a tool, the relationships of spaces can be understood. The balance between the solid and void spaces shows the connections that are vital for the success of social environments. Emphasizing further that lines connects spaces, this can be utilized to link spaces of importance and should form an overall pattern with the design. (Kraenzel, 1997)

In terms of this research, it is crucial that spaces share relationship allowing for cohesion, connection and communing. A City is Not a Tree and Lost Space theories' connective qualities offer potential strategies for an integrated design. Adopting technology in the design allows communities to form a semi-lattice structure through virtual mobility, without the need for expensive infrastructure such as new roads and train lines. Recognising that spaces are connected and share a relationship, spaces can be a linked both in micro and macro environment. This will ensure a flow and connection between spaces allowing for the "over-lapping spaces" discussed in the previous chapter. Connection can be made physically through the built environment and virtually through technology such as ICT

2.4 ENVIRONMENT
SOCIAL-ECOLOGICAL (ADAPTIVE) RESILIENCE

The concept of resilient environment involves the consideration of how we plan our communities, how we value and protect the natural environment and how we care for each other. Resilience – an ecological concept adapted to sociological settings – encourages development through improving and rebuilding of communities. Applying principle of socio-ecological resilience in the built environment ensures long term sustainability and adaptability. Finding the relationship between the built environment, its formal and informal uses, and the eco system, the theory of socio ecological resilience call for a holistic architectural response that combines both the physical, social and ecological environments   (Laboy and Fannon, 2016.)

"*The concept of resilience has been used as a conceptual framework in multiple disciplines to evaluate the ability or capacity of a person, object, entity, or system to persist in the face of disruptions or difficulty*" (Laboy and Fannon, 2016. pg 39)

'Resilience' can be applied in four domains, i.e: human systems, technical, organizational, social and economic (TOSE)(Bruneau et al. 2003; Tierney and Bruneau, 2007). The technical domain which includes physical attributes, landscapes and the built environment, focuses on the 4R model proposed by Bruneau et al. (2003) it includes robustness, redundancy, resourcefulness and rapidity. The social domain considers the population, their vulnerabilities and the adaptive strength of both the individual and communities. While this model avoids risks through early planning and post-occupancy, it does not include ecology and the natural environment. (Laboy and Fannon, 2016)
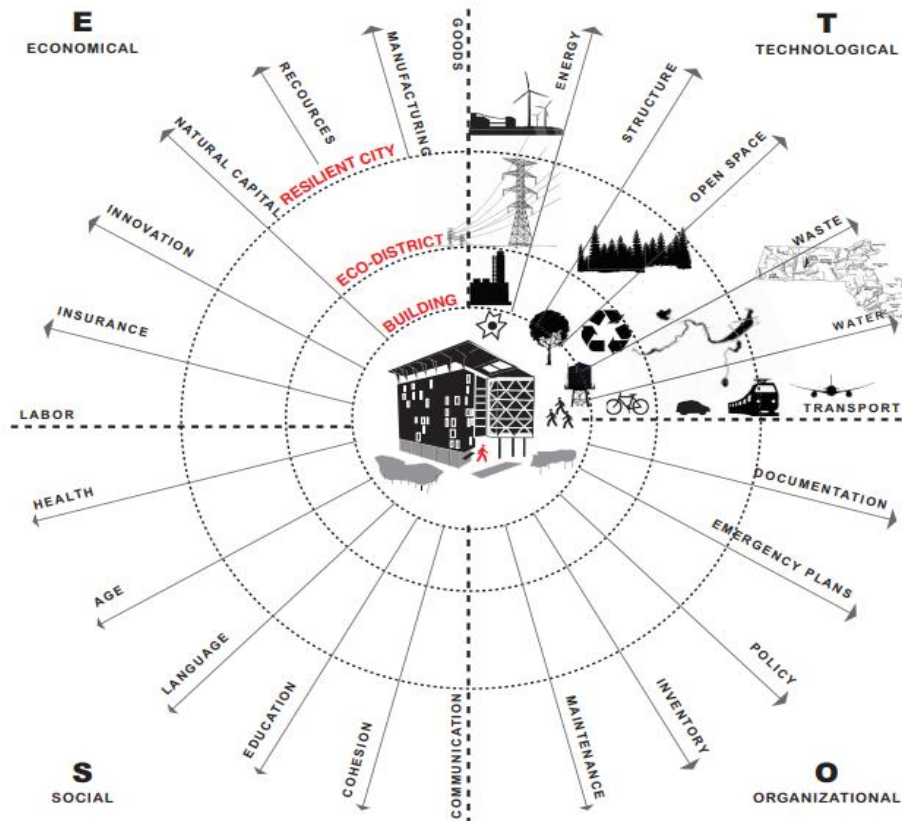
FIGURE 2.4.1: *TOSE framework generated to understand the relationship of architecture across the micro and macro environments (Bruneau et al. 2003; Tierney and Bruneau 2007).*

The diagram above figure 2.4.1 above, The building at the centre represents the intersection of all domains. This suggests that the built environment is the interactions of everything affecting everything from community to city level. Thus in order to achieve a transformative change, it is essential to include an interplay between the technical, ecological and social domains on multiple scales.

Translating this into architecture requires short-term and long-term thinking. Planning and creating ways that enable adaptation in the long-term includes finding thresholds of change and forms of resistance that allow for culturally desired stability in the short term. By providing insight on the life cycle changes of buildings and material, cradle to cradle theory provides design considerations for long term use.

2.4.1 CRADDLE TO CRADDLE

Creating a set of environmental and social principles, William McDonough and Michael Bruangart (2003) in their theory "Cradle to Cradle" encourage an innovative approach to design. Providing an alternative way of thinking, they argue that waste can be eliminated by using it after its 'useful life.' However, the waste referred to by McDonough and Bruangart is beyond physical waste. Challenging the way in which the built environment is design, C2C is based on 3 main principles:

1. Intelligent material pooling: "Waste equals food"
2. Eco-effective over eco-efficiency: "Use current solar income"
3. Triple top line: "Celebrate diversity"

(McDonough and Bruangart, 2003)

In order to achieve a positive ecological footprint, architecture should incorporate the above principles to achieve a sustainable and resilient design. Responding to the cultural, physical and climatic environment, buildings should aim from inception stage to positively affect human and environmental well-being. "*This represents a radical shift: from inanimate, one-size-fits-all structures into which we plug power and largely toxic materials, to buildings as life-support systems embedded in the material and energy flows of particular places*." (McDonough and Bruangart, 2003, pg 15)

MATERIALS

Seeking to "rematerialize", C2C theory suggest that two characteristics should be considered when choosing the material for the design. The first is the ability for the material to be used again and the second is aiming to gain maximum positive effects in the design. McDonough and Bruangart separate materials that can be recovered into two types: the biosphere and the technosphere. The first refers to the natural system and the latter refers to human production (FIGURE 2.4.2).
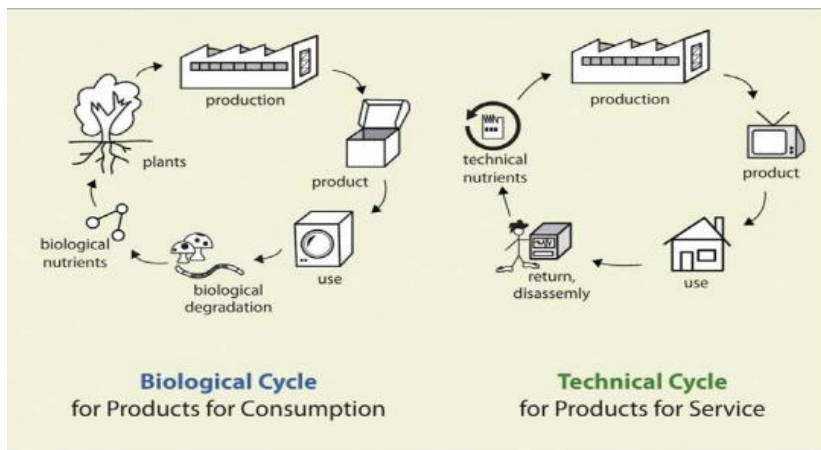
FIGURE 2.4.2: *The cycle of the biosphere and technosphere (Boucher, 2015)*

Materials produced by the technical system cannot be returned to nature and therefore need to be produced with caution, ideally avoiding material that degrades or lose integrity. Items that are produced by a combination of the two systems, termed by McDonough and Bruangart as "monstrous hybrids"(McDonough and Bruangart, 2003, pg 15) should be avoided as they either are not recyclable or too costly to separate into the different parts for reuse/recycle.

While the above explanation explains C2C in the context of a single product, buildings are made from various products/materials. Ensuring the material cycle in the built environment requires using materials that can be demountable or recused or designing spaces that can adapt to different uses over time

The principles of C2C can also extend to the use of local energy and water, placing systems in the design that ensure self-sustainability. This decreases the production and use of harmful fossil fuel needed for energy production and reduces the pollution and dehydration by rather using the collection of rainwater on site.

CELEBRATE DIVERSITY

The third principal of the C2C theory "celebrate diversity" (McDonough and Bruangart, 2003) encourages the creation of systems that allows for the growth of all three domains: economic, social and environmental. This is done by promoting the combination of

biological, cultural and conceptual diversity. The co-existence of all three diverse environments require the consciousness of existing culture, adaptation to local environments and the supporting of human activity.

"*When designers celebrate diversity, they tailor designs to maximize their positive effects on the particular niche in which they will be implemented. Engineers might profit from this principle by considering the cradle-to-cradle maxim, in which all sustainability is local. In other words, optimal sustainable design solutions draw information from and ultimately fit within local natural systems. They express an understanding of ecological relationships and enhance the local landscape where possible. They draw on local energy and material flows. They take into account both the distant effects of local actions and the local effects of distant actions. The point is this: rather than offering the one-size-fits-all solutions of conventional engineering, designs that celebrate and support diversity and locality grow ever more effective and sustaining as they engage natural systems*" (Metropole, 2014: 04)

The three ways in which diversity can be incorporated in the built environment are:

- ECONOMIC: The design of the building should be multifunctional and flexible. In allowing for the accommodation of different economic functions, C2C principles requires buildings that can be changed over time.
- ECOLOGICAL: The built environment should incorporate plants and animal life in design and functioning, thus being beneficial to ecological surroundings by supporting biodiversity
- SOCIAL: C2C principles encourage out of-the-box thinking, creativity and innovation on all scales by embracing social diversity and designing for diverse social interaction, culture and nature. It involves attracting visitors, encouraging positive interaction and providing amenities.

For the purpose of this research, applying C2C principles in the design of a tech hub it is essential to make the centre:

- Beneficial: economically, socially and ecologically
- Attractive: For the community and to attract visitors

- Innovative in design: the systems must make use of natural systems and advancements in sustainable technology.

Realizing the relationship between the social, economic and ecological systems, the hub should be designed as an eco-system while still connected and impacting positively on the larger pre-existing eco-system.

2.5 CONCLUSION

Established in this chapter was the need for architecture that:

1. Create a sense of belonging.
2. Fosters community bonds and connections.
3. Enables development.
4. Empowers and educates the community.

In order to achieve the above goals, and informed by the theories explored in this chapter, an approach to design in the three identified stages of community development (people, infrastructure and environment) can be determined.

Principles uncovered by each theory will be applied to as follows:

Firstly, a responsive architectural approach to community (conceived through the theory of place) recognizes the importance of people and site so that the architecture can create a sense of belonging. This approach intends to thereby revitalize the culture of community, fuelling the generation of a positive socio-cultural identity. By encapsulating the spirit of the community in the architecture and spaces, one can encourage 'underserved communities' to redefine their image and identity. Below are the seven spatial goals identified, in order to ensure the revitalisation of the communities

FIGURE 2.5.1 *spatial goals for the revitalisation of culture and identity in the community (diagram by author, 2018)*

Secondly, as a response to the centralisation of developmental facilities, the vision of this strategy is to facilitate social prosperity by providing the necessary infrastructure. Connecting citizens through public space and virtual mobility provides them with the opportunities and resources needed to repair, shape and contribute to the development of their locale. The diagram below indicates responsive architectural elements needed to foster collaboration, communication, communing, co-creation and co-working.

FIGURE 2.5.2: *spatial goals for the fostering of cohesion, collaboration and connection (diagram by author, 2018)*

While the identified design principles for socio-ecological resilience will be implemented in the design and materiality of the building, educational and supportive spaces are still needed. Ensuring a holistic response (social, economic, physical and ecological), the diagram below outlines spaces that encourage socio-ecological resilience
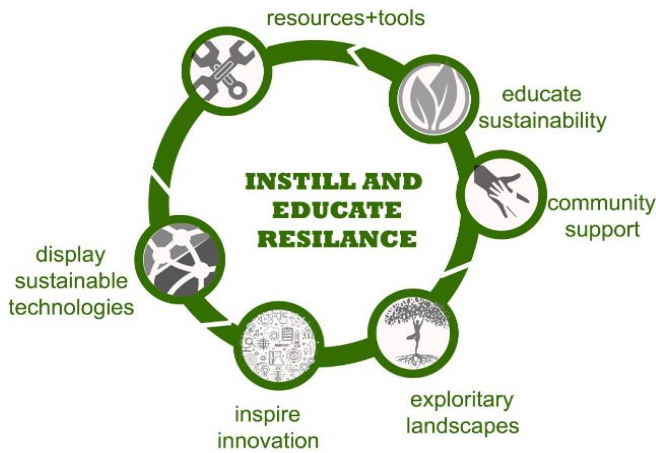
FIGURE 2.5.3 *Spatial goals to instil and educate resilience (diagram by author, 2018)*

By combining the three identified agendas and their spatial goals and carefully taking into consideration the studied theories, five types of components/programs have been identified.
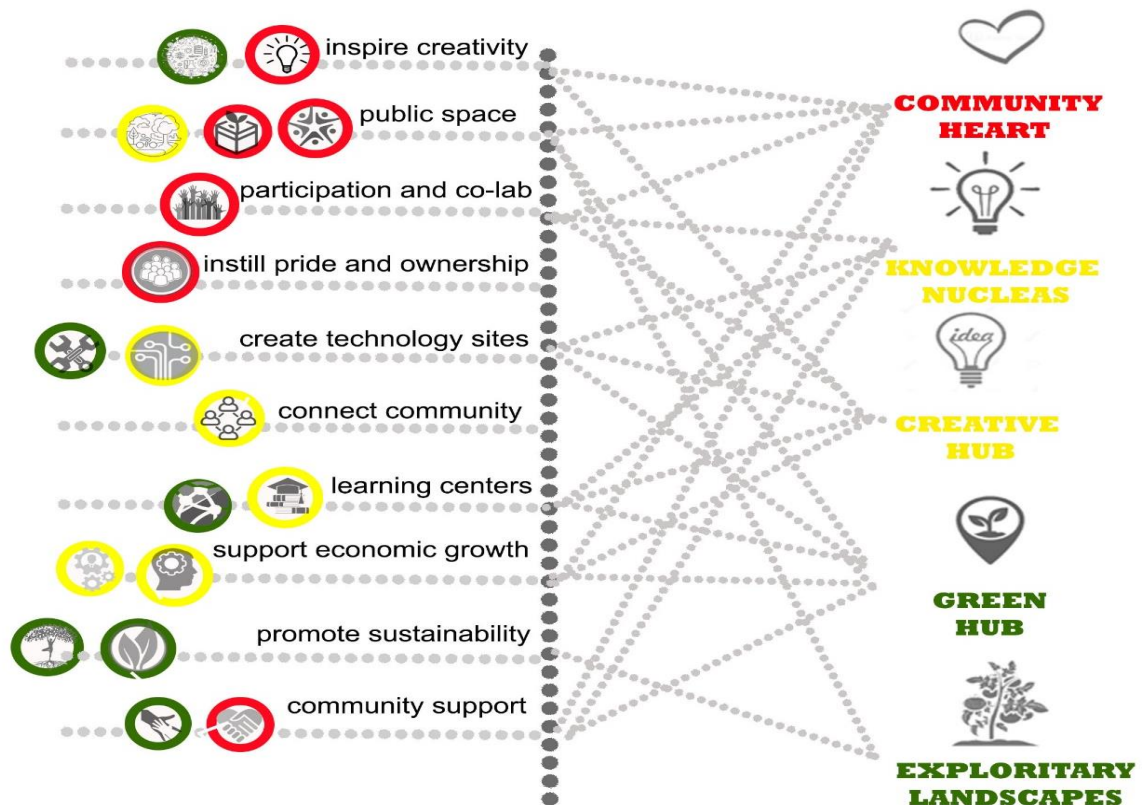

FIGURE 2.5.4: *The overlapping spatial goals identified informs the programs identified for the intervention (diagram by author, 2018)*

While the theories discussed in chapter two uncovered spatial goals which then informed the program for the intervention, the relationship between the built

environment and development will be explored further in the next chapter. The key theories discussed in this chapter together with literature will inform architectural principles/language and concepts identified in the next chapter.

CHAPTER 3

TOWARDS SUSTAINABLE DEVELOPMENT:

CHAPTER THREE

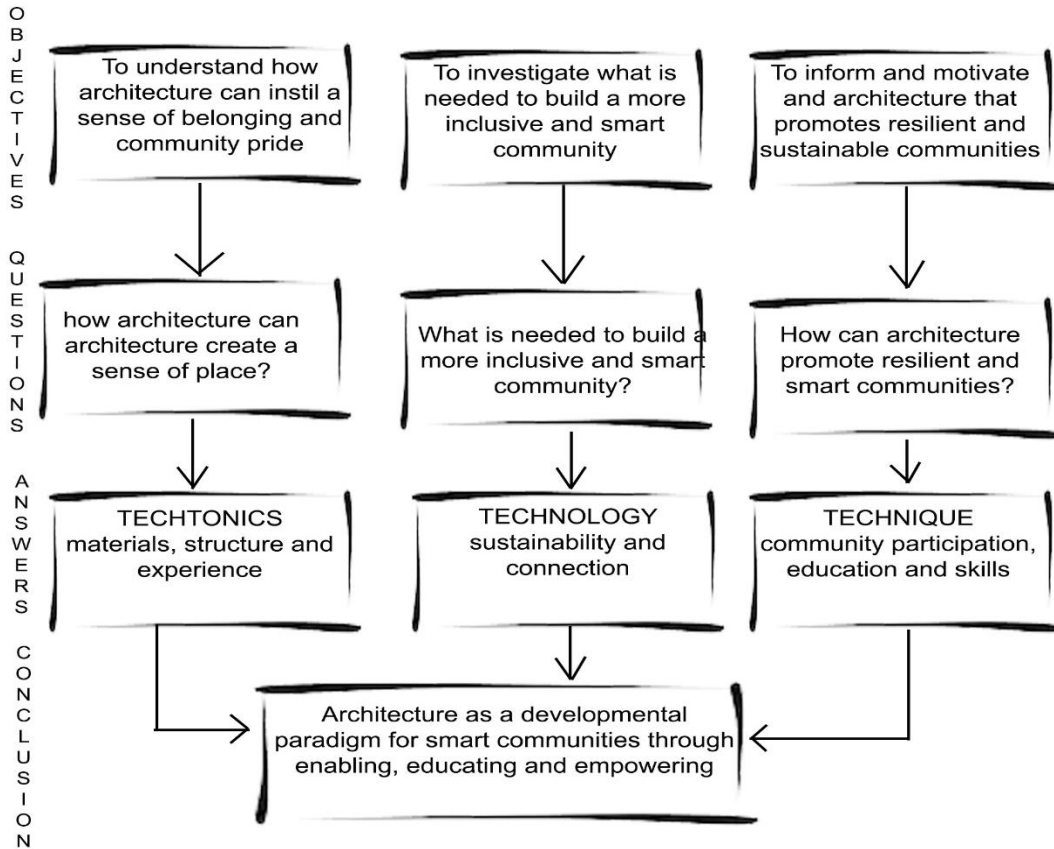## TOWARDS SUSTAINABLE DEVELOPMENT

3.0 INTRODUCTION

FIGURE 3.1: *A diagram outlining the objectives set to be achieved in this chapter along with the questions that are sked in order to achieve the objectives. Aimed towards answering the key question, 'what is the role of the built environment in enabling, integrating and empowering communities?' his chapter will conclude by outlining architectural concepts for the design of the tech hub*

(diagram by author, 2018)

This chapter begins to explore the relationship between the built environment and the enabling, educating and empowering of communities. As discovered in chapter two, the program and relationship between the community and architecture is crucial to its success. A progression will be made into the built form, spaces and architectural expression and how it can be used so that it may encourage the development of smart communities through educating methods of progression, sustainability and resilience. This closely links to the general goal of sustainable development, implying that the architectural intervention should set an example for future development

3.1 TECTONICS

Today, community development buildings are often built with economic constraints rather than architectural quality. This leads to the standardized buildings such as one big hall consisting of the cheapest possible rectangular building, brick or concrete and a roof to shelter from climate. These building often consist of the absolute necessary such as a place to commune, a clinic, etc., and most of the time have no consideration for detailing, quality of material and aesthetic value. (Frescura.F, 1990)

Tectonics, through addressing phenomenological ideas, solving structural issues and encouraging the expression of structure, offers a relationship between the form, structure and the user (Frampton.K, 2002). Community development architecture allows for the development of architectural quality when discussed in a broader tectonic understanding. Aspects of tectonics and community development architecture, which as seen in the previous chapter, is centred around place-making and can be discussed and evaluated in the characteristics of the built environment such as structure, material and experience.

Defining "tectonic syntax", Frampton (2002) states that it is the display of "*technical transfer of the load passing through a series of appropriately articulated transitions and joints.*" (Frampton.K, 2002, pg 95) He discloses that the architecture should involve context specific materials and technical capabilities.

3.1.1 STRUCTURE

Frampton (2002, pg 92) discusses the relationship between identity and architecture by stating that architecture, "*must of necessity be embodied in the structural and constructional form.*" and goes on to refer to "*the structural unit as the irreducible essence of architectural form.*" Integrating local materials into context specific combinations and respecting existing cultures into the structure produces "*architecturally-composed environmental coherence*" (Kavas.K.R,2011, pg24)

"*We should not forecast what will happen, but try to make provisions for the unforeseen.*" (Habraken, 1961 in Cuperus, 2001, pg 2) In the context of South African peri-urban communities and informed by theorist N.J Habrakens open building concept, the building should be designed so as to allow occupants to be part of the design-making process, thereby allowing the architecture to be transformative to the community (Habraken, 1987). Further emphasizing the theory of resilience studied in the previous chapter, this approach allows for the architecture to grow with people by accommodating for change and progress through its ability to alter and expand.

Supporting incremental growth of the building, a structural grid system can be adapted to requirements and expand according to need. Seen in figure 3.1.1 is a nine-grid square system with spaces arranged in different variations. This system allows creativity to be expressed in the arrangement of elements and is sustainable for future change (Love, 2003)
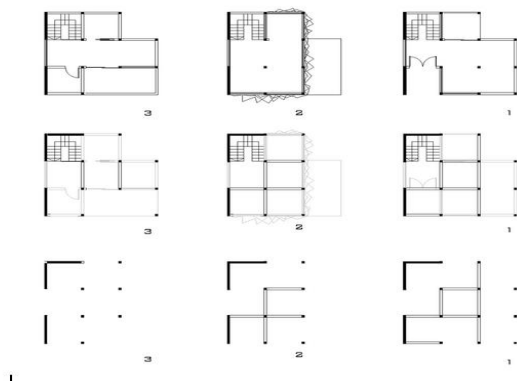

FIGURE 3.1.1: *Plans of a house based on the grid system* (https://uxmag.com/articles/what-grid-system-architecture-and-the-golden-ratio-do-for-web-design)

While this system allows for the concentration on spatial relationships, it does not address other aspects of design such as the display of identity (Love, 2003). However, while the structural grid provides a starting point for the design, the walls and spaces provide an opportunity to create a sense of identity and place through materials, patterns and arrangements

3.1.2 MATERIAL

20th Century pioneers of architecture often exhibited environmental factors, nature and material integrity in their design (Rasid and Ara, 2014) – features inherent to Critical Regionalism. Modern master architects such as Alavar Aalto and Le Corbusier believed that man should live in harmony with nature, thus allowing natural elements such as light to filter into spaces.

Fusing sustainable hi-tech systems with vernacular materials, the Jean-Marie Tjibaou Cultural Centre by Renzo Piano applies the vernacular construction knowledge of the Kanak Tribe and modern materials such as glass and aluminium (figure 3.1.2). This building displays the expression of culture through materials and structure.

FIGURE 3.1.2: Jean-Marie Tjibaou Cultural Centre by Renzo Pianon   (Rashid and Ara, 2015)

"*Indigenous, on the one hand, tends to be limited to rural built environments while, on the other, the economic state of rural indigenous communities across the continent historically associates their vernacular architecture with poverty. That has led to a general understanding of 'rural' as referring to an underdeveloped poor African community*" (Mhlaba, 2009, pg15)

Highlighting the issues of stigma that manifests in the built environment, Mhlaba implies that underdevelopment and poverty is often associated with peri-urban communities. This stigma reinforced by substantial amount of land within Durban's peri-urban communities that is occupied by informal settlements and low-cost housing. Although seen as urban problem, "shack dwellers" look to find their primary current need for shelter using various methods of construction and techniques to improve their living conditions. Rather than attaching stigmas to "shacks," their intuitive design methods can be seen as an opportunity.

In "Rethinking the Informal City" Rahul Mehrotra relates to informal settlements by explaining that the ability of residents to invent and use materials innovatively "*extend the margins of the urban system*" (Mehrotra in Hernndez, Kellett Allen, 2010). The ingenuity and creativity in providing themselves with basic shelter provides an opportunity to explore the local logic shown by the marginalized urban poor.

Considering local materials and constructions methods creates an opportunity to empower residents through on-site skills training workshops as well as foster community bonds through community participation. In accordance to the principles of sustainable development and the theory of Cradle to Cradle (as discussed in the previous chapter), locally sourced materials and locally sourced skills provide eco-effectiveness by allowing for growth in all three domains (social, economic and environmental).

3.1.3 EXPERIENCE

 "*A building is like a human. An architect has the opportunity of creating life. It's like a human body – like your hand. The way the knuckles and joints come together make each hand interesting and beautiful. In a building, those details should not be put in a mitten and hidden. You should make the most of them. Space is architectural when the evidence of how it is made is seen and comprehended.*" (Khan..L, 1957, pg 142)

Tectonics in architectural space, as described by Louis Khan in the above quote, is critical. Experiencing the relationship between structure and space through various different configurations creates different experiences for the user. Encouraging people to engage architecture can trigger certain behaviours and thoughts.

The built environment acting as a vehicle for development through tectonics can educate users on various construction methods by allowing them to experience the structure through material and structural ingenuity

FIGURE 3.1.1: *The Indian Institute of Management by Louis Khan displays strong visual expression of material and structure* (http://www.flickr.com/photos/kinokinos) (http://ad009cdnb.archdaily.net/wp-content/uploads/2010/10/)

The Indian Institute of Management by Louis Khan displays a strong sense of structural tectonic and material. Khan expresses the compressive forces through concrete ties, which allows the viewer to understand the structural systems and materials of the building. (Figure 3.1.3)

3.2 TECHNOLOGY

"*When people are empowered to make decisions about their lives and interact with the urban economy, they can become, and often do become, very successful and the neighbourhood changes with them*" (Fischelis, 2014)

Technology expands possibilities by empowering communities and introducing new innovative sustainable methods of development. It provides an opportunity to bridge the gap of social and economic inequality caused by geographic isolation through online resources, sustainable solutions and access to platforms which can address issues experienced by the poor. Thus, technology can be seen as a powerful catalyst for growth (https://news.un.org/en/story/2018/03/1004432)

For example: Digital Green is a developmental organization that empowers rural communities to improve their lives and those of others in their community by making use of technology and grass-root partnerships. This is done in a manner that's nutrition-sensitive, climate-resilient, and inclusive(http://www.digitalgreen.org/about)

IMAGE 3.2.1: *Digital green training platforms makes use of Digital Technology to provide education to local farmer across Ethiopia and Ghana* (http://www.digitalgreen.org/about-us/)

3.2.1 DIGITAL TECHNOLOGY

The revolution in digital technology through the use of ICT offers opportunities to those located away from cities and facilities (geographically isolated citizens) to improve their lives through access to resources and learning tools such as virtual libraries. ICT opens up endless possibilities and opportunities to develop in all three domains (economic, social and environmental) through learning.

However, while ICT's offer access to large amounts of information, for it to be effective it needs to be adapted to the context, local needs and languages. With the

older generation or those who did not have the opportunity to attend school having less-developed digital skills, appropriate learning opportunities should be provided. ICT's in rural communities often partner with NGO's, local organizations and small private companies to provide an extension of services to meet the various needs of the communities.

KORA is a block chain start-up that is the brain child of Dickson Nsofor, who grow up in a poor Nigerian community himself. It provides the necessary financial opportunities to prosper through virtual mobility (cell phones, laptops and ICTS's) (Kruger, 2018)

FIGURE3.2.1: KORA is a block chain platform empowers change in rural communities (http://www.itnewsafrica.com/2018/05)

The KORA initiative's effectiveness is increased by serving both the users basic needs and providing opportunities to progress. This is done by blending approaches and mixing technologies from locally relevant to technologies needed to progress. (http://www.fao.org/fao-stories/article/en/c/1105823/)

3.3 TECHNIQUE

The introduction of mass production in the industrial age resulted in the same products being available for everyone. With production through machine process, the traditional and contemporary techniques were lost due to the decrease in craft. *"The machine has become our main source of magic, and it has given us a false sense of possessing god-like powers"*. (Mumford.L, 2000, pg 137-138)

While technology allows for the expansion of skills through knowledge, the technique or the action of doing crafts such as masonry building, carpentry, woodwork, etc. is a refined skill. The techniques used in the construction of the building should harness community participation and vernacular construction. This is achieved by not losing sight of the practice of craft and technique, contributing to the aesthetic value and quality of spaces, and grounding the building in accordance to the principal of critical regionalism.

"*When we experience a product of a traditional craft, we find the inherit beauty of the natural variation of materials and more importantly, the techniques and skill of the craftsman often having a signature to their work of the craft being represented in the way they perform the action of making."* (MacManus, 2014, pg08)

3.3.1 COMMUNITY PARTICIPATION

Stemming from responsive architecture, theories of social architecture and development is the community participation approach. Suggesting that politicians and bureaucrats have excluded ordinary citizens from the developmental process, community participation theories emphasize the need for the creation of opportunities for all citizens to be politically involved and have a voice in developmental processes and strategies.

Tracing back to the 1950s and 1960s, the idea of community participation in social development was derived from third world community development movements. Implementing the concept of community participation and promoting inclusive cities,

The United Nation's Sustainable Development Goals requires the creation of opportunities for all citizens to share in the developmental process of countries.
"(*Participation*) *reduces the feeling of anonymity and communicates to the user a greater degree of concern on the part of management of administration. (With) it, residents are actively involved in the development process, there will be a better maintained physical environment, greater public spirit, more user satisfaction and significant financial change.*" (Sanoff.H, 1992, pg 56)

Community participation in design construction not only allows the community to be stakeholders in the process which fosters a sense of belonging, but also allows them to learn something on the way. The invaluable skills and new technologies that they learn in the process can be taken back to their communities and used to repair and improve their homes.

FIGURE3.3.1: *A project by Mary Gilmore in Mali Africa, based on community participation and architecture, allows the community to be part of the process, teaching members of the community along the way.*
(https://www.pechakucha.org/presentations/community-participation-and-architecture)

The building itself can also become a teaching tool by displaying sustainable construction and technology teaching users its application technique in construction and through visual learning.

3.4 CONCLUSION

ARCHITECTURE AS A DEVELOPMENTAL PARADIGM FOR SMART COMMUNITIES THROUGH ENABLING, EDUCATING AND EMPOWERING COMMUNITIES.

The built environment should encourage sustainable development of smart communities by:

Acting as a catalyst for growth through influencing, educating and enabling sustainable and innovative transformation. In order to do this, the architecture should foster community participation, display construction (tectonics) and apply sustainable technologies and passive design system from which the community can learn through construction, exploration and experience of the space.

The architecture should also encourage development in all three domains – social, economic and environmental by providing spaces that are needed for their development. An incremental design process allows for the building to grow with community adjusting to its needs and development in each domain. This strategy encourages resilience and sustainability by allowing the building to be adaptable to change.

The social spaces incorporated within the building should encourage and educate the user on sustainable development methods which can be used to better their home and community. Displaying and improving on local techniques in the area, architecture can capture the spirit of the community while still encouraging progress. In this way and in accordance to the theory of critical regionalism, the building can display a balance between local and sustainable affordable advancements, respecting the context as well as fostering progress and development.

Architectural examples that display this balance and a relationship between architecture and community development will be explored further in chapter four.

CHAPTER 4

PRECEDENT STUDIES:

4.0 INTRODUCTION

As discovered in the previous chapter, the incorporation of tectonics, technology and technique in the design of the built environment can enable, educate and empower the sustainable development of smart communities. The architectural examples studied in these chapters will explore the architectural principles and elements that contribute to incorporating the principals into the design.
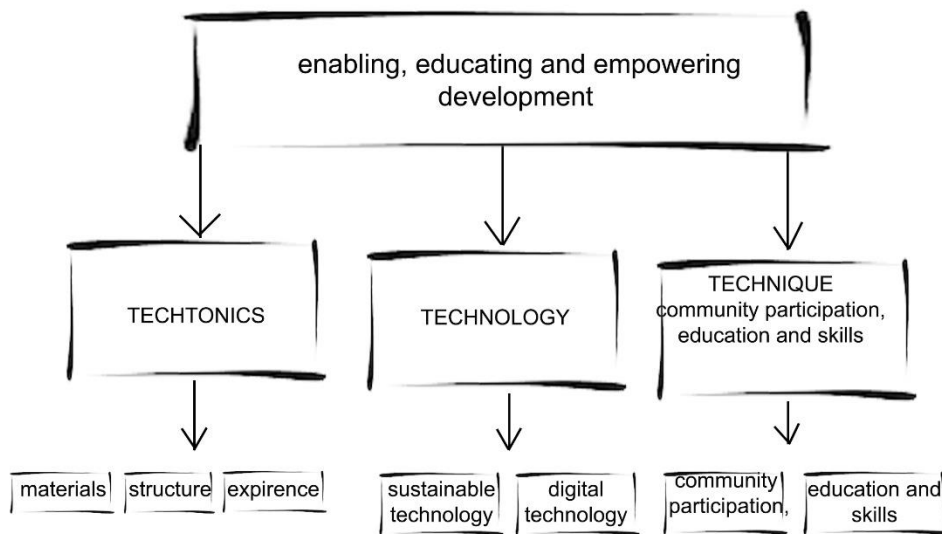

FIGURE 4.1: *A diagram showing the identified elements for the enabling, educating and empowering development. (by author,2018)*

The precedent study aims to interrogate the relationship between built environment, development and the community. Embodying the theories explored in chapter two, the selected precedent, although context specific, provides innovative examples that will be adopted and adapted appropriately in the built environment.

4.1 **MAPUNGUBWE INTERPRETATION CENTRE**

Architect: Peter Rich Architects

Client: South African National Parks

Size: 1500m ²

Location: Mapungubwe National Park, Limpopo Province

Context: A rural community consisting of predominantly informal settlements and industrial blocks. The site is located in an isolated and remote part of the Limpopo valley

Background: Located where the Limpopo and Shashe River merge, Mapungubwe National Park's architecture is difficult to identify as the land has been abandoned for centuries. However, the history of the area, the vegetation and the landscape play an integral role in the design of the centre (Tall, 2013). Declared as a heritage site in 2003, the site is a cultural landscape surrounded by various ethnic groups that claimed traditional ownership of the land.

Motivation for study: Unlike the chosen site, Mapungubwe does not have any close inhabitants nearby. However, this project displays a strong environmental and contextual response using vernacular construction and techniques. The project displays a fusion of both simple and sophisticated technology that involved people in the design and construction process.

FIGURE 4.1.1: Mapungubwe Interpretation Centre by Peter Rich

https://www.e-architect.co.uk/south-africa/south-african-interpretation-centre

TECTONICS

FIGURE 4.1.2

A photograph of the rammed earth tiles that were used to construct the vaults. The material used can be viewed from inside the Centre
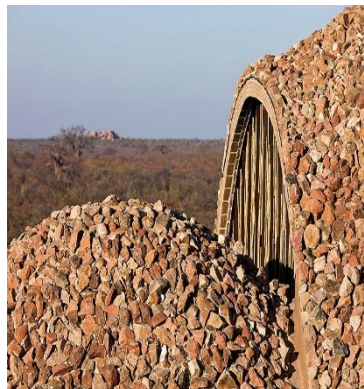
(https://www.architectural-review.com)

FIGURE 4.1.3.:

A photograph of the exterior of the vaults clad in natural sandstone sourced from the surrounding area

(https://www.architectural-review.com)

FIGURE 4.1.4

A photograph of the laths that provide solar control. Made from locally sourced timber from trees in the area. The laths also provide a soft light inside the space by breaking up the direct sunlight, creating a pattern that changes as the sun rises and sets through the day.

(https://www.visi.co.za)

Reviving a 700-year-old technique, the centre incorporates free form vaults into its design (Figure 4.1.2) (Rich, 2010, Ramage et. al, 2010). The materials used in construction are contextually relevant as they are locally sourced. The structures of the centre have been achieved through techniques that do not require big earth-moving works or embankment projects, and the natural environment is kept as natural as possible which displays complete respect for the site.

"*The surfacing of all of the masonry in local rubble stone creates a timeless quality, as if they had erupted from the earth in a geological event similar to that which created the mesas of the site and Mapungubwe Hill.*" (Ramage et.al, 2010, pg 17). As it used 85% local materials, the centre displays good sustainable building solutions. The rammed earth tiles links to the traditional buildings in the surrounding areas and embodies less energy than most building materials (Figure 4.1.2). The use of sandstone binds the building to the natural context, as it is a material abundant in area (Figure

4.1.3) (Ramage, 2010). The timber laths are used as alternative to steel and plastic louvres and displays solar control (Figure 4.1.4).

Through expressing and using traditional materials, the building creates a sense of place rooting the centre to the place. The binding of the context-specific materials and structure of the building to the people thus creates familiarity. On the other hand, the use of other materials such as recycled material, plastic sheets and steel - although limited – displays and introduces new forms of construction to the community.

TECHNOLOGY

Simple yet sophisticated, the technology of the centre's construction is an application of vernacular static principles and techniques that enables freedom in the design. Local labour forces were utilized in construction rather than machinery. Although the centre does not display sustainable or digital technology, sustainable principles are applied in the design as a response to the environment. For example, the building makes use of passive cooling systems to eliminate dependence on artificial cooling systems.
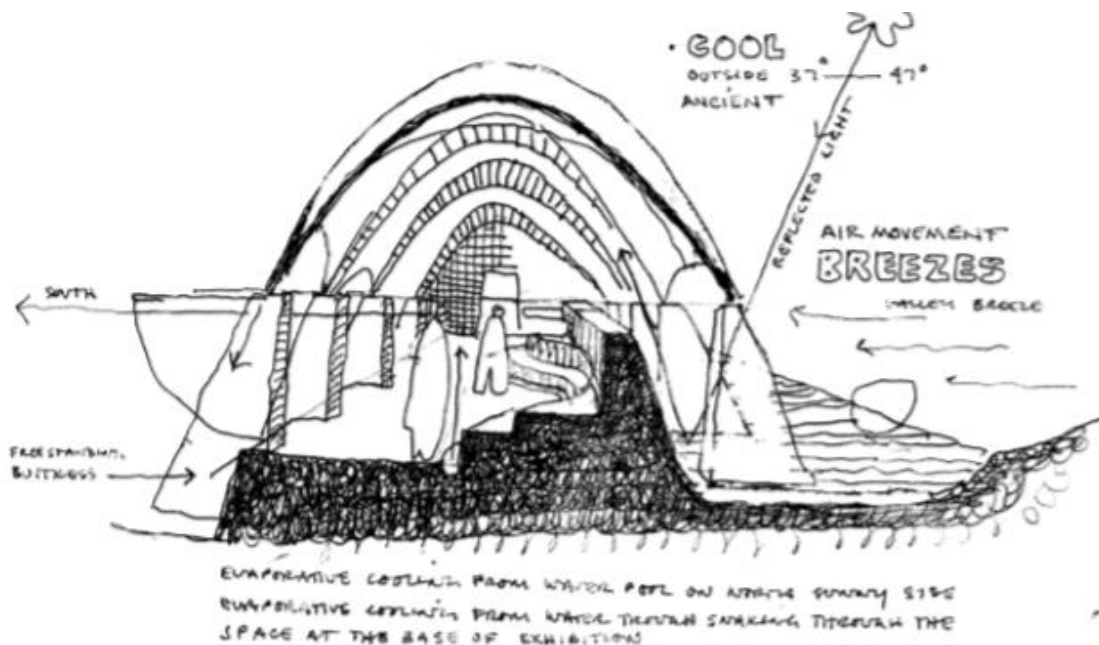

FIGURE 4.1.5: *Sketch of the environmental performance of the building.*

cool air rises from the ground (evaporative cooling) and cools the interior spaces.

The water on the northern side of the building cools the valley breezes down before

entering the building passively cooling the interior spaces (Peter Rich Architects,2016)

TECHNIQUE

The three primary tasks that were used in the construction of the vaults are:

• Tile-making

• Guide work construction

• Tile laying

All of the above were done by local labourers that were trained on site (Figure 4.1.6). The technique used allowed for multitude of free-form vaults (Figure.4.1.7) The construction method reduced the use of steel and minimised the footprint of the building by limiting the point of contact to earth (Ramage, 2010). Introducing vaults to South Africa (Tall, 2013), the building combined the new technique of tile vaulting with locally sourced materials (stabilised earth), capturing the spirit of place.

FIGURE 4.1.6

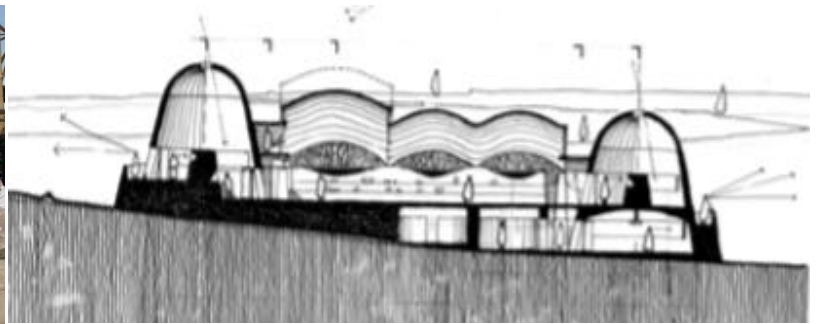*local laborers trained on*

site

(https://www.dezeen.com)

FIGURE 4.1.7

A sketch of a section through the free form vaults

(Peter Rich Architects, 2016).

4.2 WOMAN'S OPPURTUNITY CENTER

Architect: Sharon Davis

Size: 2 200m ²

Location: Kayonza, Rwanda

Client: Woman for Woman International

Context: The centre is situated in Rwanda, a semi-rural densely populated area of Africa. The site identified for the project was above a fertile valley that provided "*an ideal arena for architecture that opens a new world of opportunity.*" (https://www.archdaily.com/, 2013)

Background: The woman of the community are subsistence farmers. The idea behind the design was to enable woman of the community to become self-sufficient. A gathering place for female survivors of war, the centre is meant to be a permanent residence for the woman and provide facilities that enable empower them learn new skills including crafts and brick making.

Motivation for study: The community of Kayonza has a close resemblance to that of Welbedacht. With the same economic and social constraints, the architectural intervention studied informs the transformation of the community through empowerment. The design, in accordance to the theoretical framework studied, respects the context, creates a sense of place/belonging for the community and fosters development.

FIGURE 4.2.1
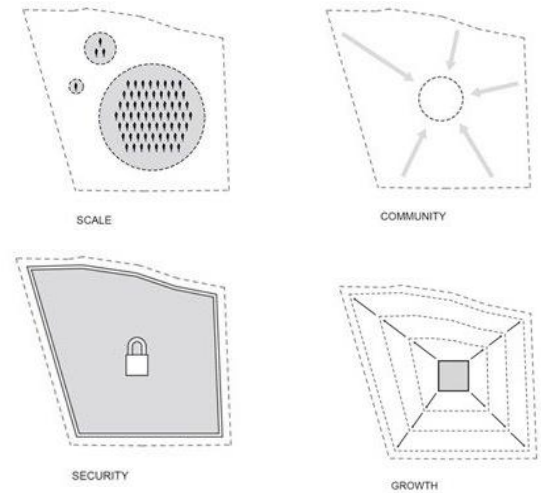
Site plan of Woman's Opportunity Center by Sahron Davis (https://www.designboom.com)

FIGURE 4.2.2

visual diagrams representing goals of the project by Sahron Davis (https://www.designboom.com)

TECTONICS

Inspired by the vernacular architecture of the villages in Rwanda, the centre is divided into seventeen pavilions. The arrangements of the human-scaled pavilions imitate the community, creating a sense of familiarity. The circular pavilion structure resembles the King's Place in South Rwanda and draws design inspiration from the indigenous woven-reed dwellings.

Applying the delicate Rwandan vernacular design construction, perforated walls allow for solar shading and passive cooling while still allowing for privacy. Clay bricks used for construction were made on site by future users. Local building materials were used in innovative ways, involving the community in construction and expanding their knowledge on the use of the materials. As expressed in the structure, the building tells the story of its constructions and inspires creativity through its innovative techniques.

FIGURE 4.2.3

Village arrangement of pavilions

https://livinspaces.net

FIGURE 4.2.4

Perforated clay brick allow for passive cooling and daylighting

https://livinspaces.net

FIGURE 4.2.5

Expression of structure in design

https://livinspaces.net

TECHNIQUE

The program of the design includes educate spaces that teach:

- income-generating skills, such as animal husbandry
- processing techniques that can sustain food cooperatives

Employing future users in the construction of the building improved their existing skills and taught them:

- new building techniques
- hands on construction

A manual press method adapted from local building techniques was used in construction as the 450 000 clay bricks for the building was made on site.

The project includes a demonstration farm to assist women on producing and marketing their own goods. This Integrated Farming Initiative educates women to produce income from the land through organic techniques for commercial production.

Compact, easily maintained animal pens and classrooms are used to teach women how to raise pigs, cows, goats, and rabbits as well as food storage and processing methods that assist them in running their own food cooperatives. Sustainable technologies used on site such as water purifiers and biogas systems can be easily reproduced by users to use in their farm/home

FIGURE 4.2.6

future users involved in construction

https://livinspaces.net

FIGURE 4.2.7

brick-making technique

https://livinspaces.net

FIGURE 4.2.8

demonstration farms

https://livinspaces.net

TECHNOLOGY

Although the projects were designed with new CAD technologies, it was built with context appropriate technologies and mechanical ways. (Davis, 2017)

Displaying passive design, the pavilions' corrugated roofs harvest rainwater while the vegetation planted on the outside of the structures provides their interiors with extra insulation. Partnering with local enterprises in the design phase, the sustainable systems (such as the water purification technologies applied in the design) can be produced by the users themselves.

Example: The community was making uses of pit latrines which pollutes the groundwater, resulting in unhygienic and unhealthy environments. The design replaced these with composting toilets, a hygienic alternative that reduced the use of water and generated fertilizer for the farms on site

Sustainable technologies used in design

- solar power generation
- sand and UV water purification,
- biogas fuel for cooking
- composting toilets

The facilities allow for the collaboration with other organizations and Wi-Fi learning programs to further education. Thus, it introduced new technology to the community.
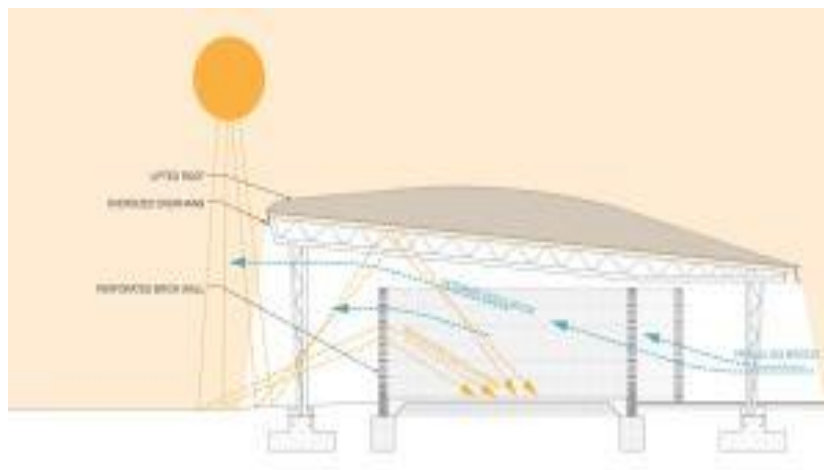

FIGURE 4.2.7

Passive design of pavilions

https://www.architectmagazine.com

4.3 CONCLUSION

This chapter set out to analyse the precedent using principals identified in the previous chapter, tectonics, technology and technique. It will, as appropriate to the context, inform the recommendations in chapter six. Although the two buildings are from different contexts, both precedents were successful in their response to context and the three different domains (social, economic and ecological environments).

Both precedents, in capturing the essence of place, make use vernacular tectonics, technology and technique while still supporting progress and development through context appropriate technology. The Mapungubwe Interpretation Centre and the Woman's Empowerment centre both harnessed community participation in construction by training the community and allowing for skills development in the process. Displaying passive design principles, both precedents were appropriately designed for its context

While Mapungubwe Interpretation Centre's response to the social environment was limited, its response to the environment provides insight into being environmentally sensitive and using sustainable materials and construction. More appropriate to the context, the Woman Empowerment centre precedent empowered the woman of the community through skills development, access to resources and community building.

A responsive architecture needs to be bound to context. The area of study, Welbedacht, will be explored and studied in the same manner as the precedent was analysed in order for the Tech Hub to respond appropriately to context.

CHAPTER 5

CASE STUDY OF WELBEDACHT:

5.0 INTRODUCTION:

The key research question of the paper is:

What is the role of the built environment in enabling, integrating and empowering communities?

Leading the investigation of built environment's role in development, the theoretical framework through various literature established the notion that the built environment should respond to context while still supporting progression. Further to that, it should foster community bonds and encourage development in all three domains (social, economic and environmental).

The previous chapter explored architectural examples that encompassed the principles identified in Chapter Three for the generation of smart sustainable communities. Although the context of the precedent had similarities, no site is the same and therefore the community of Welbedacht needs to be explored in detail as different communities have different environments (social, economic and environmental).

This chapter begins to explore Welbedacht and identifies issues and needs in the community that are crucial to its development.

The data that informed this chapter was obtained through

- Statistics from Census 2011
- Site visits guided by member of an NGO working in the community
- observations in the community
- casual conversations with community members
- structured interviews

Findings from the above sources are formally documented in the chapter to follow.

5.1 LIMITATIONS OF DATA

The data presented in this chapter was collected through site visits, structured interviews and casual conversations with community members. The unfamiliarity of the context and nature of the research required me to make frequent visits to the community in order to understand how to better the life of residents. Finding members of the community to converse with was difficult as most adults travel out for work. Accessibility to the site and various areas of the community was difficult and restricted as the roads leading into the community were not maintained. Therefore, some areas were not accessible by car and walking further down into the community was not advised by a member of the NGO working there. The case study was limited to a time period of two weeks due to the late ethical clearance received.

Despite the challenges faced, the information and understanding of the community obtained through site visits provided valuable information that could not be obtained otherwise. Observations and information obtained from site visits and conversations, all of which are presented in this chapter, will inform the design of the Tech Hu

5.2 LOCATION OF WELBEDACHT

Welbedacht, a peri-urban community 57 km away from the CBD of Durban has a population of over 8 857 households. Identified as Ward 72 by the eThekwini municipality, the community spans over 19.1 m² (Census, 2011)

DEMOGRAPHICS:

In order to design for a community, it is important to understand the people that make up the community, their needs and their current conditions. The data presented below allows for a better understanding of the community of Welbedacht.
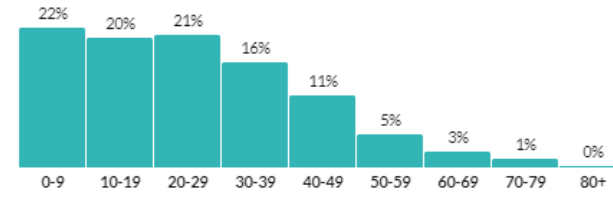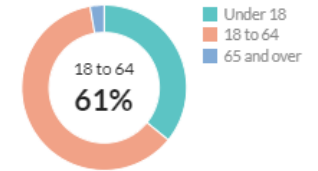
Age

24

Median age

a little higher than the figure in KwaZulu-Natal: 23

a little less than the figure in South Africa: 25

Population by age range

Chart Options ✪

22% 20% 21% 16% 11% 5% 3% 1% 0%

0-9 10-19 20-29 30-39 40-49 50-59 60-69 70-79 80+

Source: Census 2011

Population by age category

Chart Options ✪

18 to 64
61%

Under 18
18 to 64
65 and over

Source: Census 2011

Population

30 716

People

KwaZulu-Natal: 10 267 300

South Africa: 51 770 560

Population group

Chart Options ✪

83%

1% 16% 0% 0% 0%

Black African Coloured Indian or Asian Other Unspecified White

Source: Census 2011

Sex

Chart Options ✪

Female
51%

Female
Male
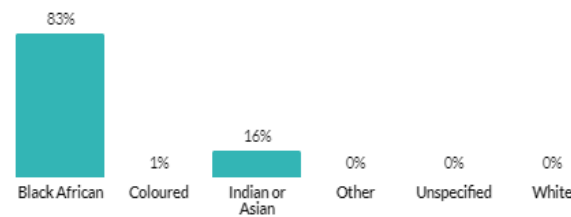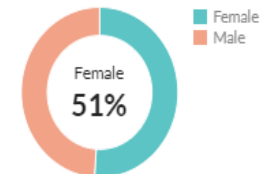
Source: Census 2011
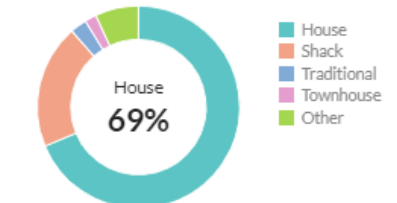
HOUSEHOLDS:

8 857

Households

KwaZulu-Natal: 2 634 122

South Africa: 15 054 254

19.9%

Households that are informal dwellings (shacks)

more than double the rate in KwaZulu-Natal: 8.03%

about 1.5 times the rate in South Africa: 13.04%

Households by type of dwelling

House
69%

House
Shack
Traditional
Townhouse
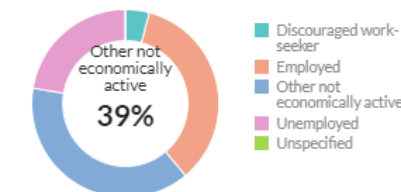Other

Source: Census 2011

ECONOMICS:

34.8%

Employed

about 10 percent higher than the rate in KwaZulu-Natal: 31.51%

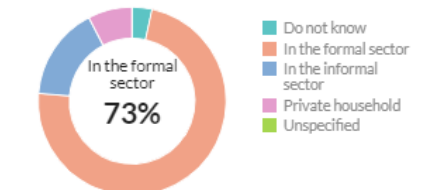**about 90 percent** of the rate in South Africa: 38.87%

Population by employment status

Chart Options ✪

Other not economically active
39%

Discouraged work-seeker
Employed
Other not economically active
Unemployed
Unspecified

* Universe: Individuals 15 and older

Source: Census 2011

Sector of employment

In the formal sector
73%

Do not know
In the formal sector
In the informal sector
Private household
Unspecified

* Universe: Workers 15 and older

Source: Census 2011

EDUCATION LEVEL

66.2%
Completed Grade 9 or higher

a little higher than the rate in KwaZulu-Natal: 64.25%

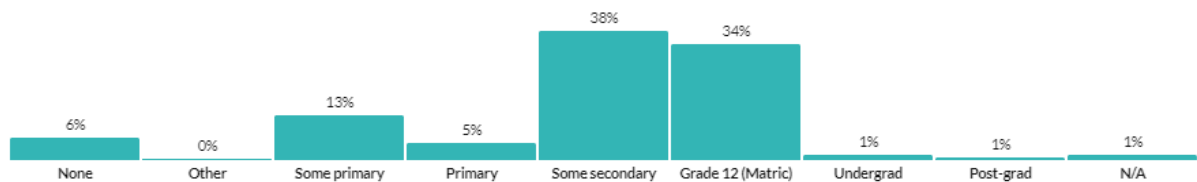**about the same as** the rate in South Africa: 65.83%

36.1%
Completed Matric or higher

about 90 percent of the rate in KwaZulu-Natal: 39.31%

about 90 percent of the rate in South Africa: 39.34%

Population by highest educational level

Chart Options ⦿

| None | Other | Some primary | Primary | Some secondary | Grade 12 (Matric) | Undergrad | Post-grad | N/A |
| 6% | 0% | 13% | 5% | 38% | 34% | 1% | 1% | 1% |

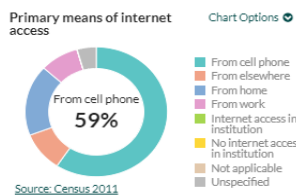* Universe: Individuals 20 and older

INTERNET ACCESS

19%
Households with internet access

about three-fifths of the rate in KwaZulu-Natal: 33.91%

about half the rate in South Africa: 35.32%

Primary means of internet access

Chart Options ⦿

From cell phone
59%

Source: Census 2011

- From cell phone
- From elsewhere
- From home
- From work
- Internet access in institution
- No internet access in institution
- Not applicable
- Unspecified

Primary means of internet access (Table ACCESSTOINTERNET)			Explore and download this data		
Column	eThekwini Ward 72 (59500072)		KwaZulu-Natal		South Africa
From cell phone	59.3%	998	51.7%	462,198	45.8%	2,434,182
From elsewhere	9.8%	165	14.4%	128,420	15.8%	841,895
From home	17.7%	297	21.7%	193,848	23.7%	1,261,314
From work	8.8%	148	10%	89,198	13%	694,088
Internet access in institution	0%	0	0%	0	0%	0
No internet access in institution	0.1%	1	0.2%	1,499	0.2%	10,717
Not applicable	0%	0	0%	0	0%	0
Unspecified	4.3%	73	2.1%	18,632	1.5%	78,562
Hide data						

FIGURE 5.1.1: Diagrams indicating the demographics in Welbedacht
source: (https://wazimap.co.za/profiles/ward-59500072-ethekwini-ward-72-59500072/#demographics)

Seen from the statistics in figure 5.1.1 is the community's high unemployment rate, low education rate post grade 9 and an almost non-existent rate of residents furthering their education. Only 19% of the community have access to internet leaving the rest isolated and disconnected to their surroundings and vital information such as news, bursary applications, voting information and more.

ACCESSIBILITY

FIGURE: 5.1.2

Community of Welbedacht

(photo by author,2018)

The main road (Welbedacht Rd), indicated in orange in figure 5.1.3 below allows vehicular access into the community joining from Unit 7 Chatsworth and leading to a dead end in the community. The secondary roads indicated in purple narrow and not maintained and thus cannot be used by buses or vehicles larger than a motor car.

The roads have no names and often end in dead ends. It was observed that residents frequently commune on roads and informal, unsafe pathways on foot to access public transports or facilities in Chatsworth (figure 5.1.2)

FIGURE: 5.1.3 *Site Plan of Welbedacht*

(by author, 2018, information obtained from www.googlemaps.com)

SOCIAL CONTEXT

The social context was studied through a series of informal conversations with residents of the community and site visits. It was learnt that there are no social activities or facilities in the locale. Through conversation with the member of an NGO in the community it was learnt that the community lacks awareness resulting in a range of hygiene and health problems. The community are not educated on diseases, risks and treatments. The NGO is the only one in locale and is not large enough to cater for community. They therefore concentrate on assisting children and woman.

A parent in the community complained "There is nothing here for our children, no libraries or facilities" A elderly man who lived most of his life in the community explained, "There is no opportunity to grow, there are no jobs here, my kids have moved out because there is nothing here for them."

Most of the residents expressed the desire to earn enough so that they can relocate to an area with more facilities and services. Lacking social capital is one of the main reasons identified for stagnant development and this leads to the lack of a sense of community or belonging.

ECONOMIC CONTEXT

The only registered business in the area is a tavern (figure 5.1.4), however, through site visits it was observed that there are small tuck shops that sell basic groceries in the community. In conversation with the community members, it was noted that most residents venture out of the community for work, however, the expense of commuting daily drastically reduces their income. Although there are skilled labourers in the community, they find it difficult to find employment as there is no opportunities in the locality

FIGURE 5.1.4:

A tavern, the only registered business in Welbedacht (photo by author,2018)

ENVIRONMENTAL CONTEXT

The river running through the community is highly polluted with waste and the vegetation surrounding has not been maintained creating dangerous areas with no surveillance.

FIGURE 5.1.5

On 14 August 2012, two boys from the community of Welbedacht were trapped by hyacinths (an invasive weed) in the river and drowned.
source:
(https://www.iol.co .za/news/south-africa)

Through observations it was noted that due to waste pollution in the streams, the flow of water has ceased in certain areas. The degradation and pollution of the environment is a breeding ground for diseases and is a hazard for the community (figure 5.1.6). Vacant areas of land were found to be polluted with construction materials and waste such as discarded timber pieces.

FIGURE 5.1.5
Environmental degradation and pollution in Welbedacht (photo by author,2018)

TECTONICS

Residents of Welbedacht have constructed self-built structures and additions to their RDP houses. They are built using block/ brick construction and no building height exceeds two floors/storeys. Construction is carried out in incremental process as per budget constraints. (figure 5.1.7)

FIGURE 5.1.7: *Construction in Welbedacht showing innovation use of materials. (photo by author, 2018)*

Houses in Welbedacht, due to self-construction methods, are sometimes not supported nor strong enough to withstand the strong winds and rains of the Durban climate. A news report from a storm on 20 September 2014 noted that at least 35 homes were reported to be damaged. This was a risk to the resident's safety, as can be seen from the mention of a 10-year-old girl who was reported to be injured by falling debris. (https://www.news24.com)

TECHNOLOGY

While tectonics explore the skills used in construction, technology future refines the skills by improving them and introducing more environmentally responsive alternatives. The RDP houses in the community make use of solar geysers, but it was observed that the orientation of some of the geysers do not allow for maximum benefit (figure 5.1.7). There was no evidence of rainwater-harvesting systems in the community yet it was observed that some residents have started well-maintained agricultural patches outside their homes.

Through investigation it was found that there are no Telkom Telephone lines in the community, limiting the access to internet. While the area is covered by cellular networks and 3G statistics show that 81% percent of the community does not have access to ICT technology due to expensive data and equipment prices. The existing institutions in the community, a primary school and an NGO, have no access to internet connection.

FIGURE 5.1.7:

Residents make use of solar geysers
(by author,2018)

TECHNIQUE

The community displays innovative use of materials, including blocks and bricks in construction. These techniques are shown in the extensions and improvements resident have made to their RDP houses. The technique displayed by the community is not only limited to building but is also seen in innovative methods of informal dwellings, extensions of RDP houses, mini garden and boundary walls. The community, however, is limited by access to materials and building technology but innovatively use what's available.

5.3 RECORD AND ANALYSIS OF RESEARCH FINDINGS

Presented below are the results recorded from primary research (interviews and observations). Prior consent was obtained from all participants involved. The identity of the participants is kept private as they shared both their positive and negatives views of the community of Welbedacht

5.3.1 STRUCTURED INTERVIEWS

CHRISTIAN LIFE CENTRE

A structured interview was conducted with a member if the Christina Life Centre, an NGO located and working in Welbedacht. This research is critical in gaining insight on the response of communities to such interventions and lessons learnt from previous projects. This information will help leap frog issues that can only be learnt from first-hand experience in such projects

Interview schedule: Appendix A

Information established:

1. The organisation has been working in the community for 17 years.
2. The organization hosts feeding schemes, runs an orphan home, ECD and hospice.
   The organization does not host any social events.
3. The community needs more awareness drives and facilities that allow people to educate and empower themselves.
4. The community has no social events as there is no space suitable for it. Most social events are hosted in Unit 7 Chatsworth. The NGO is currently trying to fund a sports grounds in the community.
5. The community responds positively to program held in the community as they really need assistance.

Closing Remarks: The community is too large for one organisation to handle, and the power to improve the community lies in the residents themselves. Many residents come

in wanting to assist but with limited resources and finances as well as focused goals on health and wellbeing, it is difficult to address all issues in the community

COMMUNITY MEMBERS

A structured interview was conducted with residents of Welbedacht. This interview aimed to gather information on the facilities needed and how architectural intervention can help improve the development of their community. The sample number was 10 people and the age gap of 20-50 years was used due to the fact that the older samples will have experienced life in the community and travel to the city.

Interview Schedule: Appendix B

1. 5/10 of the residents spent their weekend at home.

   4/10 work on the weekend.

   1/10 travelled out of the area for leisure. (Note: the community member that travelled out has access to a motor vehicle.)

2. 10/10 residents had no access to a computer or laptop.

3. Resident have access to the internet from their cell phones.

4. 5/10 residents kept up to date with current affairs through their cell phone.

   5/10 resident kept up to date via word of mouth.

5. 2/10 residents often travel to the CBD.

Note: one of the interviewees was a qualified chef but remained unemployed due to the lack of opportunity in the locale and the expense of commuting to a suitable job daily.

6. The facilities requested by the residents included:

   • community hall

   • computer centre

   • play area for children

   • food (soup kitchens)

7. Residents believed that food, opportunity to earn and entertainment will bring the community together.

8. 0/10 community members could identify their favourite community area or building in the locale.

5.3.2 CONVERSATIONS WITH RESIDENTS

Through casual conversations with community members during on site visits, the following was noted:

- Many residents are concerned for their children (future generation) as they are aware that they do not have facilities to prosper in the community.
- Many residents are subjected to high commuting fees to their place of employment located outside the community, drastically decreasing their income.
- Community members feel unsafe at night as their locale is not well lit.
- Residents expressed their desire to move out of the area as they claim it is deteriorating instead of improving.

5.3.3 SITE VISIT OBSERVATIONS

The following observations were made on site visits to Welbedacht:

- Discarded building materials were dumped on vacant land or thrown downstream.
- The stream was blocked by waste obstructing its flow.
- The stream is highly polluted by waste and the vegetation has not been maintained.
- Resident have started agricultural patches outside their home.
- RDP houses make use of solar geysers.
- Residents self-construct extensions and improvements to their home.

5.4 CONCLUSION

The case study laid the foundation and further reinforced the need to enable, educate and empower development in Welbedacht. Already geographically isolated and lacking a sense of community, the ability for the community of Welbedacht to develop themselves is further constrained by the inequalities they experience and limitations in access to resources, facilities and technology. Although residents may have the

required skill to develop their homes with their limited resources, they are unable to. The restricted opportunities in the community further add to disadvantages and economic decline experienced by the community

Informed by the identified issues, the following needs were determined to facilitate the development of the community:

1. **Foster a sense of community and civic**

Lacking social capital, the community of Welbedacht requires a social space where the community can gather, commune and interact with each other. This will strengthen community bonds and facilitate the sharing and exchanging of ideas. This need was further informed by the theory of place that was studied in chapter two.

2. **Increase opportunities for education and employment**

Connecting the community using virtual mobility will open up various possibilities and opportunities for the community. As discussed previously and emphasised by Christopher Alexandra in "A City is Not a Tree"(2015), communities need to be connected in order to avoid segregation.

3. **Introduce sustainable technologies**

Introducing sustainable technologies decreases the community's reliance on services that are not up to standard in the area. Making use of the water harvested in the river water filtration systems can ensure residents have access to a clean water supply. This approach allows for the building of self- supporting, resilient communities.

4.**Decrease environment pollution**

Through encouraging recycling and waste management, the waste pollution can be decreased Recycled materials can be incorporated into the design and used in the construction of buildings.

CHAPTER 6

RECCOMENDATIONS:

6.0 INTRODUCTION

The analysis and research carried out in the literature review, precedent studies and the case study aimed to address the problem statement identified in chapter one as thus:

Geographically isolated, peri-urban communities lack facilities and opportunities for progression and social cohesion. This together with social inequalities affects the community's morale and ability to improve and empower themselves within their locale, thus hindering its development and growth.

The chapters thus far have all formed a framework of analyses with the intention to achieve the aim (below) in order to address the problem statement:

The aim of the research is to inform a responsive architectural strategy to achieve a transformative change in underserved peri-urban communities. Informing and motivating smart and inclusive communities, a relationship between social environment and the built environment will be explored, which will promote public spaces as a generator for sustainable development.

The findings and recommendations in this chapter attempt to draw key architectural principles to answer the key research question:

What is the role of the built environment in enabling, integrating and empowering communities?

This chapter summarizes the findings of the research developed through literature, precedent studies, a case study, semi-structured interviews with resident and observations of the community of Welbedacht.

Recommendations are presented to generate design principles for the proposed architectural intervention for a Tech Hub Welbedacht that generates the development of smart sustainable communities.

6.1 THEORETHICAL IMPLICATIONS

As it has been discovered, the community of Welbedacht is not conducive to development. Instead, this community relies on traveling put of the community for access to facilities and opportunities.

During the process of research, it has been recognized that the community of Welbedacht experiences many social and economic inequalities due to their geographic isolation which results in the stagnant development of the community. Lacking resources and facilities in the locale, most residents travel out in search of employment, faculties such as schools and resources such as libraries.

Although the interviews were limited to adults of community, it is important to note that, apart from the existing primary school, there were no facilities in the area for children/youth.

Objectives set out in chapter one was achieved by answering the sub questions in the chapters thereafter through a literature review of theories and principles, precedent studies of architectural interventions in similar contexts and a case study of the community. The sub questions were answered based on the identified three drivers tectonics, technology and technique in order to enable, educate and empower the communities through development.

Sustainable development that revitalizes the culture which can improve the identity of the community; foster cohesion, collaboration and connection; and instil and educates resilience, was the overriding concepts in this research. In order to achieve a bottom-up approach, the community and context was acknowledged in each section.

Chapter one set out to understanding the problem, its history and the current state of peri-urban communities. Investigating South Africa's developmental goals, it motivates for the research and the type of development fostered and facilitated by the proposed architectural intervention of a Tech Hub.

Chapter two constructed a theoretical framework that allowed for the spatial goals for sustainable development.

Concentrating on the spatial quality, architectural language and structure chapter three was based on answering the sub questions:

1. **How can architecture facilitate and encourage for social progression and positive transformation within peri-urban communities?**

It was established that through the expression of tectonics, architecture can inspire and educate communities towards development. Therefore, the structure of the building should be expressed showing the construction process.

2. **What is needed to build a more inclusive and smart community?**

It was discovered that through the use of digital and sustainable technologies, the community can exceed the geographic boundaries and social barriers.

3. **How can architecture promote resilient and smart communities**?

Incorporating the community in the construction of that allows them to grow and strengthen their skills sets.

Chapter four explored the principles identified in the literature review against architectural precedents. This further informed the aspects of the community that were explored in case study of Welbedacht in chapter five. Answering the key question "What is the role of the built environment in enabling, integrating and empowering communities?" specific to the community of Welbedacht, the case study identified issues and existing environments that will be used to formulate a responsive architecture.

6.3 RECOMMENDATIONS

The recommendations set out key design principles in which to develop a responsive architectural strategy for the generation of smart communities in Welbedacht. These were developed through the exploration of literature, precedent studies and a case study that included semi-structured interviews and on-site observations.

The theoretical framework that was presented led the research to establish an architectural design concept of architecture as a developmental paradigm for smart communities through enabling, educating and empowering underserved communities.

This concept implies that the built environment should encourage sustainable development of the community through facilitating programs, teaching skills and inspiring change.
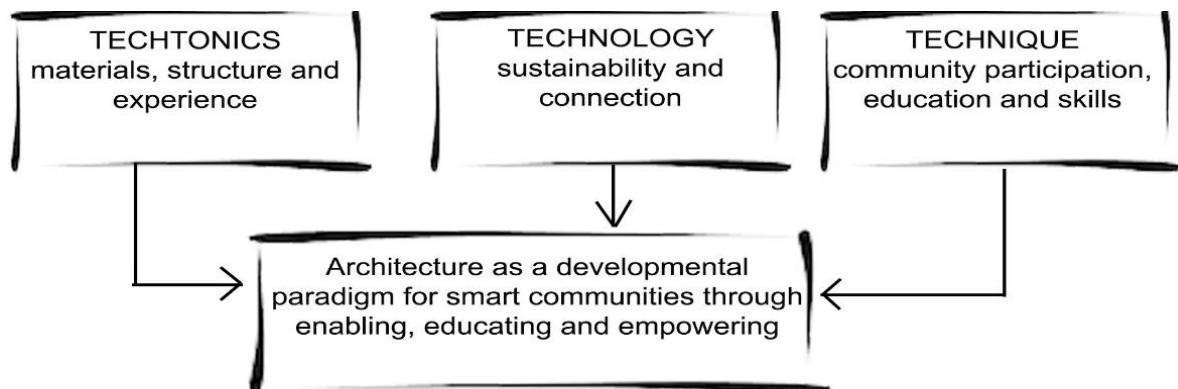
Figure 6.3.1: *Through the tectonics, technology and technique used and applied in the construction of the building the community is empowered, enabled and connected through hands on skills training, education, resources and technology (by author, 2018)*

TECTONICS

Expressing of tectonics in the construction and architecture of the building can inspire and educate communities towards development. By using and improving on material and construction found in the community, the building allows users to learn from it. The building becomes the teacher by displaying construction that can be implemented in their homes, thereby inspiring and educating development.
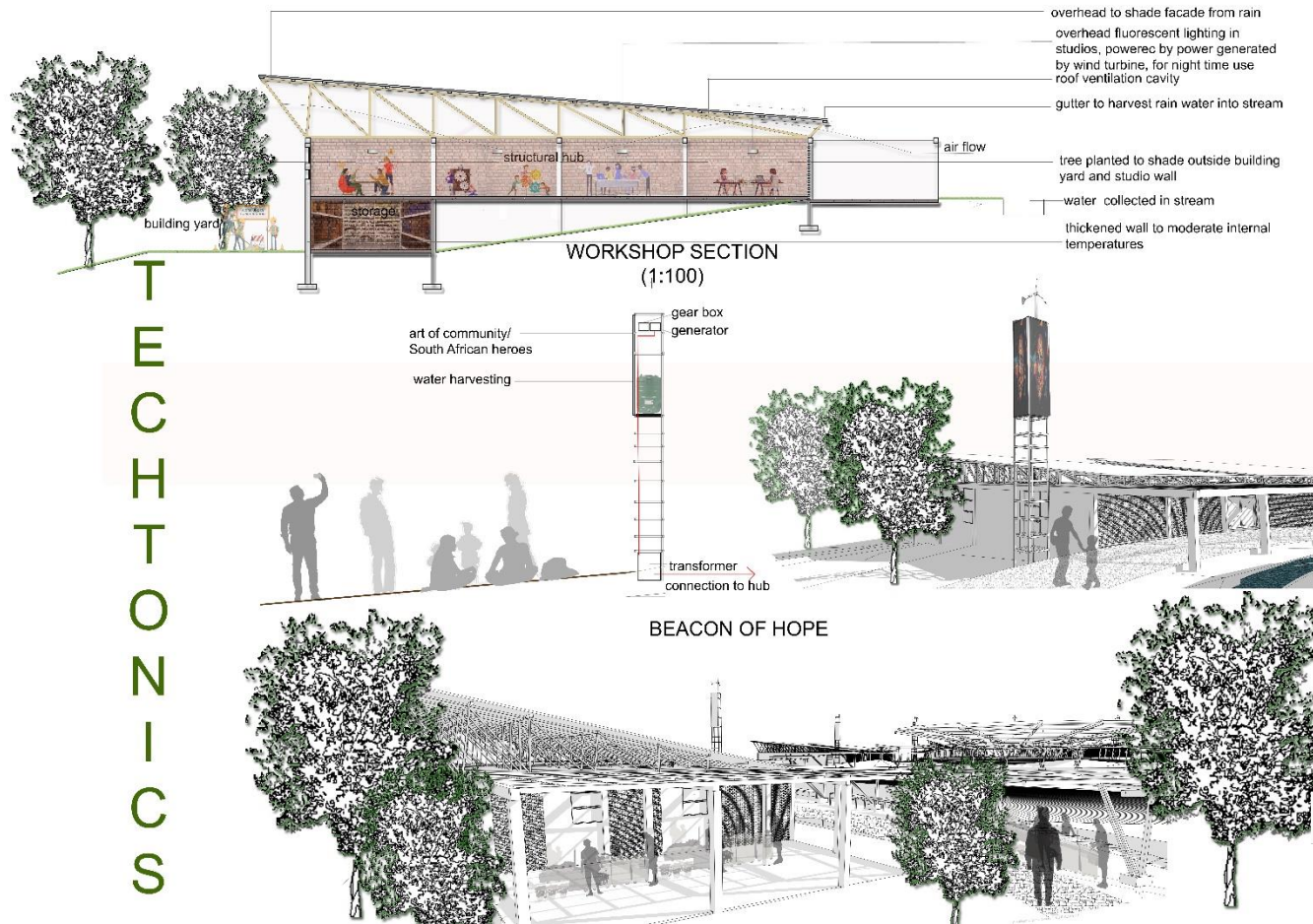

Figure 6.3.2: *The tectonics of the design informs and educates the community in developing their skills by displaying construction methods and materials that can be adapted to improve their homes (design by author, 2018)*

TECHNOLOGY

Making use of sustainable technology, the building can introduce and educate the community on sustainable alternatives, empowering them to provide the services that are not up to standard, for themselves. For example: those who do not have access to running water can makes use of technology to purify stream water for domestic use.

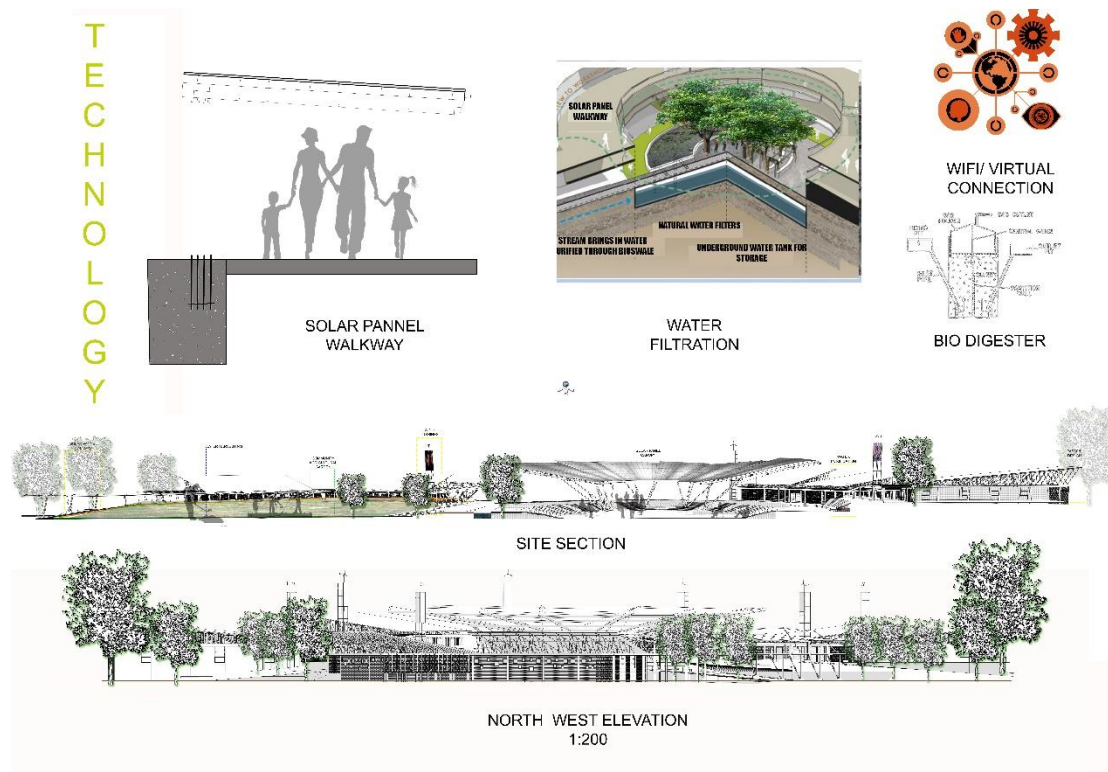Digital technologies can tackle the issues of geographic isolation by making possible virtual mobility which connects the community to opportunities, networks and resources

Figure 6.3.3: *The various sustainable technologies shown in the figure used in the building is made visible to the user displaying its application. These technologies and methods can be applied on a domestic scale in order to improve the homes and services in the community (design by user, 2018)*

TECHNIQUE

Techniques can be taught both in construction and facilities in the tech hub. Empowering the community by improving and building their skills not only allows them to develop their homes, but creates employment opportunities for them as well.

Figure: 6.3.4: *The techniques taught in the construction of the building include wood work, installation of solar panels and sustainable technologies, innovative use of materials brick laying and much more (design by author, 2018)*

6.4 CONCLUSION

In conclusion, the proposed Tech hub will utilize the identified spatial goals and design principals recommended in this chapter. Thus the architectural intervention responsive to the context will fuel the development of smart sustainable communities in the disadvantaged, geographically isolated community of Welbedacht.

6.5 FURTHER RESEARCH

There is further research needed to be done in Welbedacht. One of the gaps is the problems faced by children of the community. There are no facilities for their development and many community members expressed their concern for the education of their children.

Health and wellness awareness facilities such as clinics in the community are non-existent. An NGO working in the community emphasized the need for permanent clinic in the community and awareness of diseases such as HIV, as he had found there were high levels of infected individuals in the community. Although touched on the research, another gap identified was the need for public transport and an upgrade of infrastructure in the community.

CHAPTER

7

DESIGN:

WHERE ?

Welbedacht

LOCATION

Co-ordinates:
-29.932795, 30.857814

The site is located along the main road (Welbedacht ,Rd), central to the community and accessible by vistors.

A large area of land was selected so that the facilites can expand for future use and growing need.

The existing stream running through site presents and oppurtunity for water harvesting, while the orintation if hte site allows for passive design and solar power harvesting

towards Unit 7

north

lower Welbedacht community

Located 22.5km away from the city, the community of WELBEDACHT lies between Umlazi and Chatsworth. While its neighbouring communites have developed into peri-urban nodes, Welbeadcht remains underdeveloped.

The main road, Welbedacht road, is the only form of access in and out of the community. Public transport can not be accesed from within the community,

Densely populated with RDP housing.
Disconnected frpm social and economic environments the residents in locale are depedent on employment or informal trade outside the community as a source of income

Unemployment rate: 76%

Matric completion rate : 36%

Welbedacht WHY ?

DISCONNECT
81% of the community have no access to technology
There is no social facilites, economic environments or oppurtunites to progress in the community.

Program

entry/social space

co-spaces/ open learning

confined work/private spaces

Sustainability

water harvesting

power harvesting

cross ventilation

overhang to shade facade

Material

thickened brick wall

airbrick

Alternative materials

Sustainable technology

hubs prototype

co work/co learn (knowledge nucleas) 1:200

learning center (knowledge nucleas) 1:200

agricultural lab (greenhub) 1:200

workshops/studios (creative hub) 1:200

The Socio-cultural technical hub

Design Ideology

Welbedacht is a community on the periphery of Durban.Isolated and underdeveloped a tech hub is is madetory for its devlopment.

By combining learning, seeing and expiriencing through technolgy, technique and techtonic, the community will gain various levels the tech hub

creation of micro economy

agriculture

skills development

connection

diffrent leanring expirences

virtual

open classroom learning

confined space learning

community building and development

community spaces

cohesive spaces
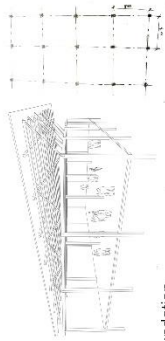
Foundation

a simple structure for the community to gather under, meet, exchange ideas, organise projects and recruit volunteers for construction. Based on a 8x8m grid the structure can easily expand(incremental growth)
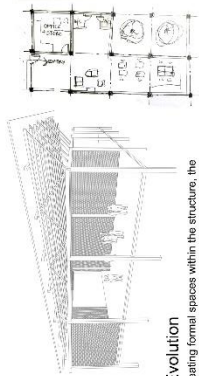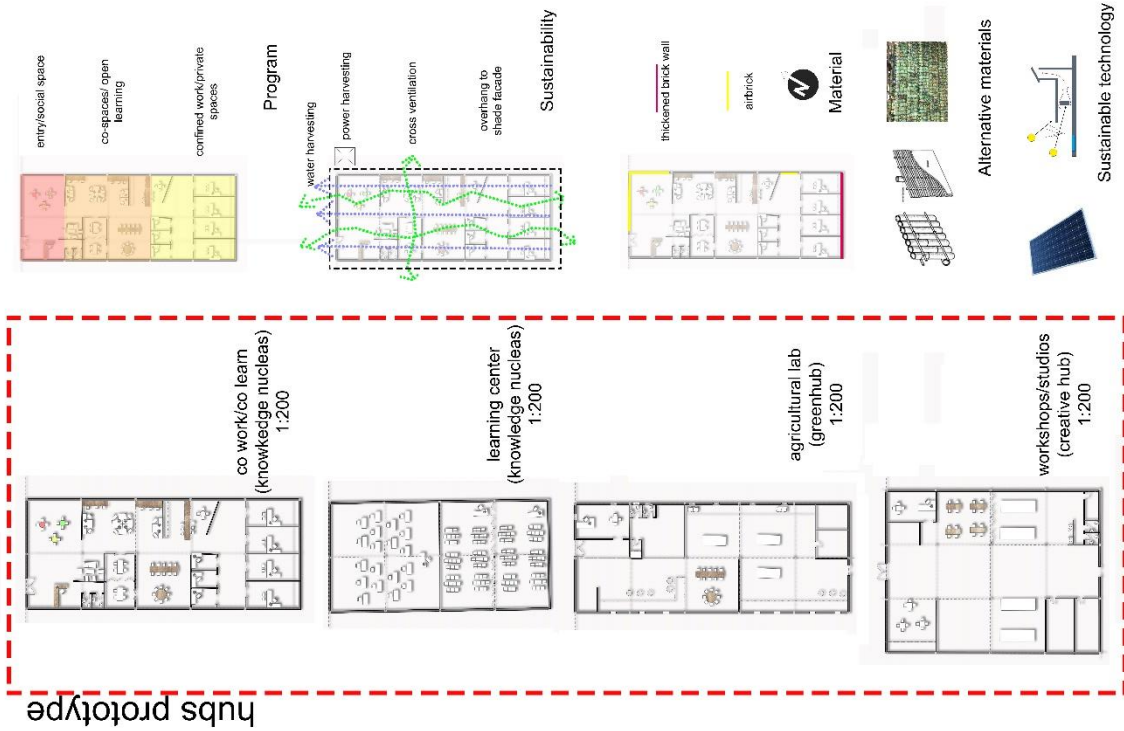
Evolution

creating formal spaces within the structure, the community would assist in the infill structure that can range in materials. This not only stregthtens communties lies but allows for members of the community to learn/explore/share/practice skills
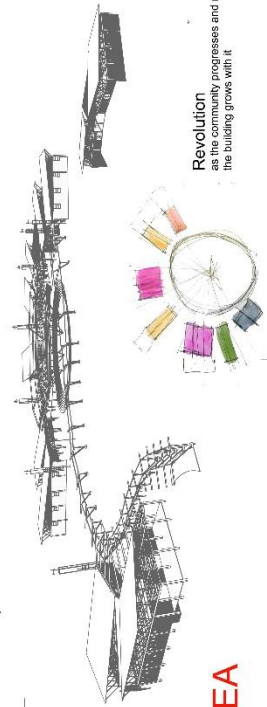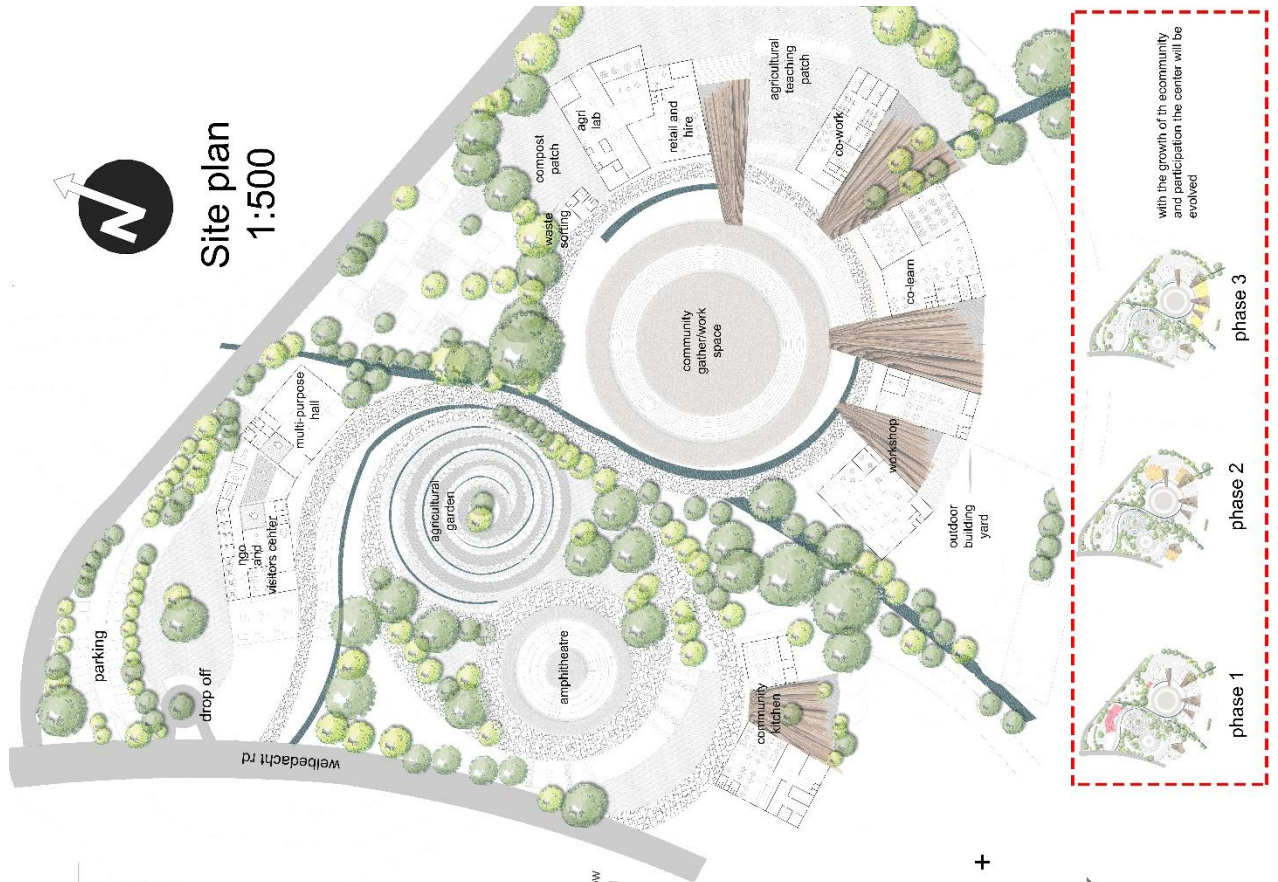
Revolution

as the community progresses and needs change the building grows with it

The IDEA

Site plan 1:500

with the growth of th ecommunity and participation the center will be evolved

phase 1 phase 2 phase 3

welbedacht rd

parking · drop off · ngo and visitors center · multi-purpose hall · agricultural garden · amphitheatre · community kitchen · waste sorting · compost patch · agri lab · retail and hire · community gather/work space · agricultural teaching patch · co-work · co-learn · workshop · outdoor building yard

DESIGN EVOLUTION

This layout represents the existing site. The site ventures to blend nature with modern amenisties.
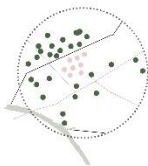
The entrance to the site is along the stream. The journey through the site follows the flow of the stream. vehicular acess is kept to the outer edge to allow for uninterupted people movement through the site
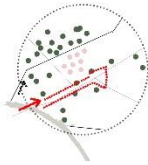
The building evolved around the contours and existing vegetation. The topography of the site allow for the stream to run along the building edge supplyin all facilites. Filtration pods on the higher end of the site filters the water running down the stream.
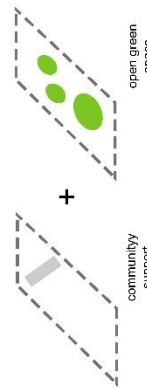
the buidling creates a journey through the site of seeing, learning, doing and centeral social spaces, for sharing of knowledge and community building

the building layout and design to allow for water and solar power harvesting
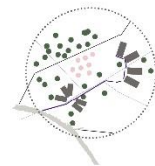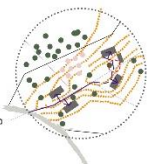
the building form ts based on a radial concept and for future expansion

COMMUNITY PROGRAMS

community support

open green space

social (community heart)

facilities

agricultural patch + composting

co work

co-learn

outdoor working spcae

green hub

knowledge nucleas

exploratory landscape

workshops

outdoor working spcae

creative hub

TECH HUB

PLAN
1:200)

compost patch

waste collection + sorting

composting toilets

lab office

lab

safety gear + display

research

exhibition

machine hire and retail

agricultural teaching patch

covered
(working space with wifi connection and power ports)

event space

lounge

meeting room

co-work

kitchen

print

confined learning (lectures)

open learning spaces

studio manager

covered outdoor working space

safety gear + exhibition

studio manager

assembly

outdoor building yard

servical delivery access

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REFERENCES

A

Allen, S., 2009. Practice: architecture, technique+ representation. Routledge

Allen, Adriana. "Sustainable cities or sustainable urbanisation." Retrieved April 18 (2009): 2014.

Ali, Dalia Osama. Building community in low-income areas: designing a new architectural language for community centers in Jordan. Diss. Massachusetts Institute of Technology, 1997.

Alexander, C., 1964. A city is not a tree. 1965.

B

Ballon, P. and Schuurman, D., 2015. Living labs: concepts, tools and cases. info

Bennett, J., 2011. Platforms of Engagement: A process of critical engagement within a developing context. M Prof Dissertation. Pretoria: University of Pretoria.

Bhatia, B., 2014. Auroville: A Utopian Paradox.

Bennett, J., 2012. Platforms of engagement: a process of critical engagement with a developing context (Doctoral dissertation, University of Pretoria).

Boucher, R., 2015. Applying the principles of cradle-to-cradle to urban planning (Doctoral dissertation, Humboldt State University)

Brooks, D.A., 2011. Situated Architecture in the Digital Age: Adaptation of a Textile Mill in Holyoke, Massachusetts.

C

Christopher, A.J., 2001. Urban segregation in post-apartheid South Africa. Urban studies, 38(3), pp.449-466.

Cole, S., 2006. Cultural tourism, community participation and empowerment. Cultural tourism in a changing world: Politics, participation and (re) presentation, pp.89-103.

Cox, K.R., 1979. Location and public problems: A political geography of the contemporary world. Maaroufa Press, Incorporated.

Cullen, C., 2013. Connection Modelling as a Mechanism for Addressing Social Inequality in Durban's Peri-urban Built Environment: A Proposed Public Transport Hub (Doctoral dissertation, University of KwaZulu-Natal, Durban)

Claassen, J.M.P., 2015. Regeneration in Contested Post Apartheid Urban Space: Towards the Design of a Remediation Hub in the Durban South Basin (Doctoral dissertation, University of KwaZulu-Natal, Howard College).

D

Day, C. (2002) Spirit & Place: Healing our Environment Healing Environment, Architectural Press. Oxford.

Day, C. (2004) Places of the Soul. Oxford, Architectural Press

Dewar, David, and Roelof Sarel Uytenbogaardt. South African cities: A manifesto for change. Urban Problems Research Unit, University of Cape Town, 1991.

DESA, U., 2009. Creating an Inclusive Society: Practical Strategies to Promote Social Integration

Dayaratne, R. and Samarawickrama, R., 2003. Empowering communities in the peri-urban areas of Colombo. Environment and Urbanization, 15(1), pp.101-110.

Davies, S., Wiley-Schwartz, A., Pinkett, R. and Servon, L., 2003. Community technology centers as catalysts for community change. New York: Ford Foundation.

E

Europe. International Journal of Innovation and Regional Development, 1(4), pp.405-422.

F

Fattahi, K. and Kobayashi, H., 2008. Analyzing world evolution and its effects on urban designing. Cercetări practice și teoretice în managementul urban, 3(9), pp.74-94

Fattahi, K. and Kobayashi, H., 2009. New era, new criteria for city imaging. Theoretical and Empirical Researches in Urban Management, 4(3 (12), pp.63-72

Frampton, K. (1980) Modern Architecture: A critical History. Thames and Hudson Ltd. London, United Kingdom.

Frampton, K.   (1983). The Anti-Aesthetic - Towards a Critical Regionalism : Six points for an Architecture of Resistance. Great Britain: Pluto Press

Fourie, D.J., 2001. Mechanisms to improve citizen participation in government and its administration. South African Journal of Economic and Management Sciences, 4(1), pg.216-233.

G

Gillette, Eileen, Linda Ham and Daniel Pringle. Technology as Development Tool. Slums: Bridging the Digital Divide. Accessed on Decemer 20, 2012 from http://techslums.wordpress.com/.

H

 Harvey, D. (2012). Rebel Cities: From the Right to the City to Urban Revolution, London: Verso

Harrison, P., Todes, A. and Watson, V., 2007. Planning and transformation: Learning from the post-apartheid experience. Routledge

Heidegger, M. (1971) Poetry, Language, Thought. Harper and Row Publishers, New York, USA.

I

Irrgang, Berendine. A study of the efficiency and potential of the eco-village as an alternative urban model. Diss. Stellenbosch: University of Stellenbosch, 2005

K

Kretzer, M. and Hovestadt, L. eds., 2014. ALIVE: Advancements in adaptive architecture (Vol. 8). Birkhäuser.

Kim, S. and Kwon, H.A., 2018. Urban Sustainability through Public Architecture. Sustainability, 10(4), p.1249.

L

Lindskog, Helena. "Smart communities initiatives." Proceedings of the 3rd ISOneWorld Conference. Vol. 16. 2004.

Love, T., 2003. Kit-of-Parts Conceptualism: abstracting architecture in the American academy. Harvard Design Magazine, 19.

M

Macagnano, E.V., 2002. Peri-urban areas of South African cities: innovative technologies for sustainability. WIT Transactions on Ecology and the Environment, 54.

MacManus, S.C., 2014. Architectural Tectonics: A Shift Between the Cultural Tradition of Making to Contemporary Building Processes (Doctoral dissertation, Virginia Tech).

Minke, Gornot. Building With Earth: Design and Technology of a Sustainable Architecture. Basel, Berlin, Boston: Birkhauser Publishers for Architecture, 2006.

McDonough, W. Braungart, M. (2002) Cradle to Cradle. Vintage Books, London

N

Norberg-Schulz, C. (1980) Existence Space and Architecture, Rizzoli International Publications, New York.

P

Paskaleva, K.A., 2009. Enabling the smart city: The progress of city e-governance in

Padgett, D.K., 2016. Qualitative methods in social work research (Vol. 36). Sage Publications.

R

Rashid, M. and Ara, D.R., 2015. Modernity in tradition: Reflections on building design and technology in the Asian vernacular. Frontiers of Architectural Research

Rossman, B.F., 2014. Entrepreneurial Tech-Ed.: using technology to fuel income generation education in rural Ghana(Doctoral dissertation, Massachusetts Institute of Technology).

S

Segalo, P., 2015. Gender, social cohesion and everyday struggles in South Africa. Psychology in Society, (49), pp.70-82.

Sassi, P., 2016. Built Environment Sustainability and Quality of Life (BESQoL) Assessment Methodology. In Engaging stakeholders in education for sustainable development at university level (pp. 21-32). Springer, Cham.

Senagala, M., 2001. Speed and Relativity: Toward Time-like Architecture. In Proceedings of the ACSA Annual Meeting (pp. 36-370). Baltimore, Maryland

Sanoff, H., 2000. Community participation methods in design and planning. John Wiley & Sons.

Shannon, K. and Smets, M., 2010. The landscape of contemporary infrastructure. Rotterdam: NAi Publishers.

Sokhela, S.C., 2006. The impact of peripherally located low-income housing projects in eThekwini municipality: a case study of slum clearance project, Welbedacht.

T

Tompkins, E. and Adger, W.N., 2004. Does adaptive management of natural resources enhance resilience to climate change?. Ecology and society, 9(2).

Thorpe, A. and Gamman, L., 2011. Design with society: why socially responsive design is good enough. CoDesign, 7(3-4), pp.217-230.

Z

Zheng, Y. and Walsham, G., 2008. Inequality of what? Social exclusion in the e-society as capability deprivation. Information Technology & People, 21(3), pp.222-243

 https://www.pechakucha.org/presentations/community-participation-and-architecture

http://www.fao.org/fao-stories/article/en/c/1105823/

http://bizenginepost.co.za/winch-energy-iwayafrica-partner-launch-winch-hub-accelerate-energy-internet-access-rural-areas-uganda/

APPENDIX A

INTERVIEW SCHEDULE: **CHRISTIAN LIFE CENTRE**

This research questionnaire form complies with the Code of Conduct for Research;

Research Ethics Policy V; School Committee for Research Ethics under the Combined

Proposal and Ethical Clearance (HSF.14).

Section A: DISCLAIMER

Disclaimer

Answer all questions honestly in full to the best of your ability. The reviewer will base their analysis and conclusions on the

information provided on this questionnaire form. Incomplete questionnaires cannot be evaluated fairly. There is no right or wrong answer. Questionnaire will be conducted and all answers will be recorded on an electronic device.

The research herein may or may not be utilized or form part of the dissertation, RESPONSIVE ARCHITECTURAL STRATEGY FOR THE GENERATION OF SMART COMMUNITIES: An integrated tech hub in Welbedacht, Durban Which will be submitted in fulfilment of the requirements for the degree of Master of Architecture, in the Graduate Programme in Architecture, University of KwaZulu-Natal, Durban, South Africa.

Confidentiality

The researcher: -

a) shall treat all Confidential Information belonging to the other party as confidential and safeguard it accordingly; and

b) shall not disclose any Confidential Information belonging to the other party to any other person without the prior written consent of the other party, except to such persons and to such extent as may be necessary for the performance of the Agreement or except where disclosure is otherwise expressly permitted by the provisions of the Agreement.

Section B: Bibliographical

Name of interviewee:

Position in organization:

Opening:

My name is Saadiyah Dockratl, a Master's student in Architecture from the University of KwaZulu - Natal, Howard College. I am currently pursuing my Master's Thesis :A

RESPONSIVE ARCHITECTURAL STRATEGY FOR THE GENERATION OF SMART COMMUNITIES: An integrated tech hub in Welbedacht, Durban

The aim of the research is to investigate the current developmental approaches to undeserved peri-urban communities and how technology can be applied within architecture to give residents a dynamic space to meet and exchange ideas of innovation, actively participating in the development of their community.

In order to gain more information on Welbedacht and previous outreach projects held by the organization in the community I hope to use the information gained in my research study towards a proposed architectural intervention in the community. The interview should take about 20 minutes. Are you available to respond to some questions at this time?

1. How long has the organization been working in Wellbedacht?
2. What type of community projects are held by the organization?
3. What facilities in your opinion is needed in the community?
4. Does the community have any social events?
5. Does the organization host any the social events? (if yes explain)
6. What is the community response to projects held by the organization? (positives and negatives)

APPENDIX B

INTERVIEW SCHEDULE**: Community Members**

This research questionnaire form complies with the Code of Conduct for Research;

Research Ethics Policy V; School Committee for Research Ethics under the Combined

Proposal and Ethical Clearance (HSF.14).

Section A: DISCLAIMER

Disclaimer

Answer all questions honestly in full to to the best of your ability. The reviewer will base their analysis and conclusions on the

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Section B: Bibliographical

Name of interviewee:

Occupation:

Opening:

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A RESPONSIVE ARCHITECTURAL STRATEGY FOR THE GENERATION OF SMART COMMUNITIES: An integrated tech hub in Welbedacht, Durban

The aim of the research is to investigate the current developmental approaches to undeserved peri-urban communities and how technology can be applied within architecture to give residents a dynamic space to meet and exchange ideas of innovation, actively participating in the development of their community.

In order to gain more information on Welbedacht and previous outreach projects held by the organization in the community I hope to use the information gained in my research study towards a proposed architectural intervention in the community. The interview should take about 20 minutes. Are you available to respond to some questions at this time?

1. What do you usually do on the weekend?
2. Do you have access to a computer?
3. Do you have access to the internet?
4. do you keep up to date with current affairs? (if yes, how?)
5. How often do you visit the CBD? (if yes, why?)
6. What facilities would you like in your community and why?
7. What in your opinion will bring the community together?
8. What is your favorite community area/building?