THE ROLE OF THE SKA IN ENHANCING SOCIOECONOMIC SUSTAINABILITY – A SOCIAL ENTREPRENEURSHIP APPROACH

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By Hubert Mathebula

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Approval of the Thesis

THE ROLE OF THE SKA IN ENHANCING SOCIOECONOMIC SUSTAINABILITY – A SOCIAL ENTREPRENEURSHIP APPROACH

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Doctor of Philosophy **(**PhD**)** in Business Administration

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Abstract

THE ROLE OF THE SKA IN ENHANCING SOCIOECONOMIC SUSTAINABILITY – A SOCIAL ENTREPRENEURSHIP APPROACH

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The Square Kilometre Array (SKA) is a "Big Science" infrastructure project. The project is expected to impact its local communities positively. Several studies conducted on the SKA project report significant improvements in the socioeconomic dynamics in the area. However, documented evidence shows that the claimed socioeconomic developments are difficult to define and measure, while they are largely irrelevant to the people of the Karoo. Thereby diminishing the positive impact claimed by the project.

Big Science projects such as the SKA are established to advance the science knowledge enterprise. This thesis argues that these projects have a lateral mandate to uplift local communities as a form of return on their massive fiscal investments, while also necessitated by the need to gain and secure a social license to operate. It is generally difficult to quantify the social impact of Big Science initiatives in communities. This thesis uses Social Value as a practical approach, based on the philosophy of humanism integrated into social entrepreneurship, to deliver and measure socioeconomic impact.

Using the sequential exploratory mixed methods approach, the study determines the nature of social value as defined by the community of Carnarvon and gauges the extent to which the social value exists in the community.

The study found that the SKA project has made significant progress in uplifting the socioeconomic situation in Carnarvon, indicating Big Science projects' ability to deliver on the

lateral mandate of socioeconomic development. The findings and recommendations of this study provide a practical solution to socioeconomic intervention by Big Science projects.

Declaration

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise, by reference or acknowledgement, the work presented is entirely my own.

AI Acknowledgement

Use of AI:

I acknowledge my use of ChatGPT and Grok, https://chatgpt.com/ and https://x.ai/grok, to generate ideas on how best to analyse data when a latent variable is being measured. I also used the same AI tools to request a comprehensive list of academic works that mention the SKA and its social impact. I confirm that all academic material obtained through AI was independently verified and authenticated. I further confirm that no AI text was imported into the thesis.

I further acknowledge the use of Grammarly, https://www.grammarly.com/, to check spelling and grammar errors in my work. The Grok and ChatGPT AI tools' use was related to Chapters 4 and 5, and Grammarly was used throughout the thesis as a spelling check tool.

The prompts used include:

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Hi Grok, please give me a full list of academic publications that deal with the social impact of the SKA project. I did not use prompts on Grammarly as it automatically suggests correct spelling and grammar as the text is input.

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Dedication

I dedicate this thesis to my late mother. Her unwavering love for education and quest for knowledge inspired her to return to the classroom and pursue learning even in her pension years. Her conviction that education could transform lives, open doors, and give one the courage to shape their own destiny motivated me throughout this journey.

She may no longer be here to witness this achievement, but her values, sacrifices, and enduring love have remained a source of strength and purpose.

I dedicate this work to her, with love, gratitude, and profound admiration.

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Table of Contents

Abstract iii

AI Acknowledgement vi

Copyright Page vii

Dedication viii

Acknowledgements ix

Table of Contents x

List of Tables xvii

List of Figures xviii

List of Acronyms xix

CHAPTER 1: PURPOSE AND RATIONALE OF THE STUDY 1

Introduction 1

Statement of the problem 8

The Dichotomy of Developmental Objectives 8

Defining and Measuring Social Value 12

Big Science Funding Policy 13

Summary 17

Purpose of the Study, Research Aims, and Objectives 18

Purpose 18

Aim of the study 19

Objectives 19

Research Questions and Hypothesis 22

Research Questions 22

Hypothesis 23

Nature and Significance of the Study 24

Nature of the Study 24

Participants 26

Methods 27

Significance of the Study 27

Innovation 29

CHAPTER 2: LITERATURE REVIEW AND CONCEPTUAL APPROACH 31

Introduction 31

Literature Review 33

Scope of Literature Review 33

Analysis of Literature 35

Theme 1: Relational Dynamics in Big Science Management: 36

Theme 2: Competing Priorities: 40

Theme 3: Measuring Impact: 46

Theme 4: Policy as a Driver of Impact 50

Theme 5: Big Science Contributions to Social Development 55

Final Thoughts on the Literature Review 59

Conceptual Framework 61

Humanistic Management – A Historical Perspective 62

Humanism as an Organising Imperative 68

Humanism and Vulnerable Groups. 73

A Broader Perspective of Humanism. 77

Humanism and Leadership. 80

Humanism and Dignity 82

Humanism and the SKA Project in the Karoo 85

Social Entrepreneurship 89

Field Analysis 92

Analysis of Social Settings 92

Conditional Antecedents of Social Entrepreneurship 95

Women in Social Entrepreneurship 98
Social Entrepreneurship Research Methodologies and Approaches 100
Societal Issues Impacting Social Entrepreneurship Research 102
Contextualising Social Entrepreneurship 104
The Nature of Social Entrepreneurship 105
Social Entrepreneurship in the Context of Big Science 107
Concept Alignment: Social Entrepreneurship in Relation to the Social Enterprise 110
Social Entrepreneurship-based Socioeconomic Sustainability 111
Summary 112
Key Constructs and Variables 113
Social Value 113
Stakeholder Engagement and Consultation 117
Ethics and Integrity 119
Synergy in Humanism and Social Entrepreneurship 122
Delineating Karoo-Based Social Value as a Latent Variable 123
Socioeconomic Value from the SKA Perspective 123
Socioeconomic Value from the Community Perspective 126
Measurement Approach 129
Conceptual Modelling 132
Summary and Conclusion 134
CHAPTER 3: RESEARCH METHOD 137
Introduction 137
Research Approach and Design 138
The Qualitative Approach 140
The Quantitative Approach 140
Mixed Methods Design 141
Methodological Design 142

Population and Sampling 144
Sample Size for the Qualitative Phase 148
Sample Size for the Quantitative Section 150
Operationalisation of Variables 151
Data Collection Tool for the Semi-Structured Interviews 154
Quantitative Variables 156
Operational Definition of Variables 156
Administering the Survey 157
Study Procedure and Ethical Assurances 158
Ethical Assurances 158
Biases 160
Data Collection and Analysis 163
Data Collection Plan 163
Qualitative Data 164
Qualitative Data Analysis 165
Quantitative Data 167
Data Type 169
Quantitative Data Analysis 170
Summary 170
CHAPTER 4: FINDINGS 173
Introduction 173
Trustworthiness of Data 176
Credibility 177
Transferability 178
Dependability 178
Confirmability 179
Confirmation of Trustworthiness 180
Reliability and validity of data 182
Reliability 182

Validity 184
Results 185
Qualitative Results 186
The Coding Process 186
Quantitative Results 194
Quantitative Data Collection Approach 195
Demographics 198
Disjoint Two-Stage Partial Least Squares Structural Equation Analysis 200
Hypothesis Testing 203
Frequency Analysis 206
Evaluation of Findings 211
Linking the Qualitative Results to the Quantitative Approach 214
The extent of Social Value in Carnarvon 216
Observing the Worth of Human Beings 216
Engaging Stakeholders 218
Restoring and Protecting the Dignity of Individuals 220
Inclusivity 221
Ethical Conduct, Integrity, and Honesty 222
Protecting Vulnerable Groups 224
Social Value in Carnarvon 225
Summary 227
CHAPTER 5: IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS 229
Introduction 229
Implications 230
Formulating Social Value 232
Extent of Social Value in Carnarvon 233
Linking Theory to Evidence 239

Sustainability 242
Limitations 245
Methodological Limitations 245
Sampling Challenges 247
Analytical Limitations 250
Limitations of Scope 250
Language 251
Researcher's Reflections and Biases 253
Summary 255
Implications to Practice 257
The Humanistic Social Value Model 257
Conceptualisation and Planning 260
Conceptualisation: 260
Stakeholder Consultation 260
Theoretical Alignment: 262
Technical Analysis 262
Theory of Change 263
Stage 4: Intervention Design 263
Stage 5: Execution 264
Alignment with SDGs 264
Recommendations for Application 265
Applying the Humanistic Social Value Model 267
Recommendations for Future Research 269
Conclusions 270
REFERENCES 274
Appendix A: Schematic Representation of the Research Process 302
Appendix B: Semi-Structured Interview Guide 303

Appendix C: Survey Questionnaire – English Version.....304
Appendix D: Survey Questionnaire – Afrikaans Version.....308
Appendix E: Random Samples for the Qualitative Study.....312
Appendix F: UREC Ethics Approval.....313
Appendix G: Informed Consent Form.....314
Appendix H: The Coding Process.....316
Appendix I: Cronbach's Alpha Results for the Survey Questionnaire.....317
Appendix J: Descriptive Statistics – Survey Data.....321
Appendix K: Descriptive Statistics – Survey Data.....323
Appendix M: REAF Form.....328
Appendix N: Gatekeeper Authorisation.....336

List of Tables

Table 1: Sampling of the Carnarvon Community 149

Table 2: Reliability test results for the survey questionnaire 183

Table 3: Coded Themes and Supporting Sub-Themes 192

Table 4: Distribution of Race in the Sample 199

Table 5: Age distribution in the sample 199

Table 6: Gender distribution in the sample 199

Table 7: Internal Consistency, Reliability and Convergent Validity 200

Table 8 : Discriminant Validity (HTMT Matrix) 201

Table 9: Structural Equation Model Bootstrapping 202

Table 10: Hypothesis - Social Value Determinant Construct Matching 203

Table 11: One-Sample t-Test Scores 204

Table 12: Percentage Agreement with Item 1: Improved Living Conditions 224

Table 13: Percentage Agreement Item 2: Effective Community Engagement 207

Table 14: Percentage Agreement Item 3: Dignity 208

Table 15: Percentage Agreement Item 4: Inclusivity 209

Table 16: Percentage Agreement Item 5: Ethics and Integrity 210

Table 17: Percentage Agreement Item 6: Protection of Vulnerable Groups (Ubuntu) 210

Table 19: Alignment of SDGs with the Carnarvon Social Value Imperatives 244

List of Figures

Figure 1: The MeerKAT Telescope in the Karoo 123

Figure 2: Area Coverage of the SKA and Affected Towns 124

Figure 3: Hierarchical Conceptual Model of Social Value 132

Figure 4: Social Value Determinant Variables Ecosystem 152

Figure 5: Confirmed Structural Model of Social Value 215

Figure 6: Humanistic Social Value Model 266

List of Acronyms

AMOS	Analysis of Moment Structures
CBA	Cost Benefit Analysis
CFA	Confirmatory Factor Analysis
CNAO	Centro Nazionale di Adroterapia Oncologica (National Centre for Oncological Hadrontherapy
CSR	Corporate Social Responsibility
DA	Dignified Approaches
E&I	Ethics and Integrity
EFA	Exploratory Factor Analysis
FAST	Five-hundred-meter Aperture Spherical Telescope
GSE	General Self-Efficacy
Inc	Inclusivity
MeerKAT	Karoo Array Telescope
MMSE	Mixed Methods Sequential Exploratory
MVS	Maximum Variation Sampling
NRF	National Research Foundation
OECD	Organisation for Economic Co-operation and Development
PBMR	Pebble Bed Modular Reactor
PCA	Principal Component Analysis
PLS	Partial Least Squares
PROMYSE	Promoting Youth Social Entrepreneurship
PVG	Protection of Vulnerable Groups
SAM	Social Accounting Matrix

SARAO	South African Radio Astronomy Observatory
SDG	Sustainable Development Goals
SE	Stakeholder Engagement
SEM	Structural Equation Modelling
SKA	Square Kilometre Array
SKAO	Square Kilometre Array Observatory
SLO	Social License to Operate
SMME	Small, Medium, and Micro Enterprises
SPSS	Statistical Package for Social Science
SSC	Superconducting Super Collider
SSI	Semi-Structured Interview
SVI	Social Value Imperative
ToC	Theory of Change
U	Ubuntu
UN	United Nations
UREC	Unicaf University Research Ethics Committee
USA	United States of America
WoH	Upholding the Worth of Human Beings

CHAPTER 1: PURPOSE AND RATIONALE OF THE STUDY

Introduction

It is generally expected that investments in large infrastructure projects should result in some form of societal value that improves people's living conditions (Cruz, 2019; Mansell & Philbin, 2020). Ivanov (2019) has found that large-scale infrastructure projects that have the potential to positively impact living standards are more likely to elevate a country's economic and geographic standing. However, this expectation is easily achieved by large infrastructure projects that have a service delivery or social impact mandate. This may not be the case with large infrastructure projects in the field of science. For instance, a large-scale infrastructure project that involves the construction of a dam in a rural area will likely have the long-term impact of improving people's lives through access to running water, over and above the economic and social impacts, which include short-term employment for the locals and boosting economic development through the procurement of goods, services and materials during the construction period. Thacker et al. (2019) agree that large infrastructure projects within the services sector are better positioned to deliver direct impact to communities than science-based projects. This is so because the objectives of these projects are more likely to be linked to the global Sustainable Development Goals (Mansell & Philbin, 2020). As such, the direct social benefits of scientific projects, such as the Square Kilometre Array (SKA) project, can be difficult to imagine and even more challenging to quantify.

The SKA is a global endeavour to build the world's most powerful radio telescope, with one component located in the Karoo region in South Africa and the other in Western Australia and the headquarters situated at the Jodrell Bank Observatory in Manchester, UK (Santander-Vela et al., 2021). The project is managed by the SKA Observatory (SKAO), an international treaty organisation headquartered in Manchester, with offices in South Africa and Australia (Santander-Vela et al., 2021; *The Journey to the SKA Observatory - Public Website*, n.d.).

South Africa and Australia won the bid to host the telescope after a lengthy bid process. As part of the bid process, South Africa designed and constructed a 64-antenna telescope called the MeerKAT. This instrument was completed in 2018, and efforts are underway to expand it with more antennas while the construction of the actual SKA telescope is also proceeding.

The SKAO aims to invest approximately 3 billion euros in the construction of approximately 133 receptors that will look deep into the universe to understand its origins (Pellegrini et al., 2021, p.1). Scientists who were excited about the concept of the largest and most sensitive radio astronomy telescope in the world when it was first spoken about some 20 years ago called it "a paradigm-shifting radio telescope for the next generation with enormous potential for transformational discoveries" (Green & Baan, 2007, p.1). Thirteen years later, those directly involved with the project still believe it was a magnificent idea, almost a science and engineering miracle (Adam, 2020). However, it is difficult to say the same for the local, economically deprived people living in the small towns in the rural Karoo.

Gastrow and Oppelt (2018) observed that, although to some extent there may be some level of consensus on the benefits of large-scale infrastructure projects at a global and national level, largely related to knowledge production, the emergence of new and innovative technologies and general development of scientific prowess, there is hardly any recognisable impact at the local level. Even at the global level, there is a glaring lack of empirical evidence as to the actual impact of these developments on human and social development. Gastrow and Oppelt (2018) made their specific finding using the SKA project as a test case, implying that, although there are pockets of socioeconomic development initiatives being implemented in the areas close to the project, there is still no empirical evidence to back any claim of social value and positive impact in the communities (Gastrow & Oppelt, 2018). The project is flanked by four Karoo towns, namely Carnarvon, Williston, Vanwyksvlei, and Brandvlei. Farming land belonging to natives of these towns was annexed to be used for the construction of the

telescope. It is primarily for this reason that the residents anticipated some sort of positive development from the implementation of the project; however, as observed by Gastrow and Oppelt (2018), the residents had not realised the anticipated development at the time of conducting their report.

The FAST telescope in Guizhou province in China could be used as an example of a large-scale infrastructure project in the science domain that has realised tangible socioeconomic benefits that impact its local community. Although not empirically tested, the development of the Five-hundred-meter Aperture Spherical Telescope (FAST) has resulted in the creation of a new Astronomy Town, five Kilometres from its location, which seems to be thriving economically. Jingyi (2023) reports that the town receives about 400 visitors daily and about 2,000 visitors on a good weekend. The local people benefit from the influx of tourists into the area as they provide hospitality services such as accommodation, restaurants, tour operators, and other services. These offerings complement the tourism pull of the telescope, thereby creating a vibrant economic hub anchored in astronomy tourism. This will no doubt continue to have far-reaching implications for the socio-economic sustainability of the area and its people.

Developing the area into a tourism hub was a deliberate effort by the implementers of the FAST to ensure direct spinoffs of the astronomy initiative into socioeconomic development. The development was made in consultation with the local community; as such, the business opportunities are welcome, embraced and managed by the people to make a living for themselves.

This is an isolated case, which could, perhaps, be attributed to the developmental trajectory in Chinese society, which is significantly ahead of other regions. Unlike the FAST, many other Big Science projects have not been able to meaningfully and positively impact the lives of the local people. Gastrow and Oppelt (2018) confirmed this observation in their study,

which looked at the impact of Big Science projects on human development from the perspective of the SKA project, and one of their observations was that the SKA project is unable to demonstrate and prove direct impact despite the huge expectation for it to do so.

Social value is increasingly emerging as the most practical approach to determining the success of infrastructure projects (Behar & Sykes, 2022; Denny-smith et al., 2021; Fitton & Moncaster, 2021; Fujiwara et al., 2021; Kalyviotis et al., 2020; Watts et al., 2021). However, Nalewaik and Williams (2021) believe that delineating social value within the context of large infrastructure projects, specifically those within the astronomy domain, is highly contested and is either a function of the assessor's ideological orientation or a superficial guess that may not be an adequate representation of the reality on the ground.

The problem is further compounded, at least for the SKA project, by its unique location in the central Karoo. The SKA project's location presents an ideological tension between national development priorities and the strong sentimental attachments to the Karoo, driven by identity politics and connection to land and heritage (Burnett, 2021; Walker, 2019; Winter et al., 2021). From a national and global developmental perspective, the Karoo is "a peripheral space, far removed from the metropolitan mainstream and unrepresentative of the South African countryside as a whole" (Walker, 2019, p.6). The Karoo is considered the arid heartland of South Africa due to its dry, barren, yet vast expanses. It is the largest province by land mass in South Africa, covering nearly 30% of the country by area. In contrast, the area is occupied by only about 2% of the nation's population, clearly illustrating a vast region characterised by a sparsely spread populace. However, in its sparsity, the area is known for its unique geographic features and vegetation that blend into the vast plains, making it a wonder and a marvel to experience. It also has a rich heritage as one of the few areas that show evidence of early human life activity. For its indigenous people, it is a special place.

To most people outside the Karoo, the vast plains of the Karoo represent something entirely different from what they mean to the indigenous population. Not surprisingly, an assessment by a foreign renewable energy company of the heritage significance of a piece of land that was earmarked for the construction of power transmission infrastructure in the Karoo determined that there was nothing of historical or heritage significance on the land, as it was barren without any structural features (Winter et al., 2021). The assessment failed to perceive the unique features of the area as significant heritage for the local occupants.

When traversing the considerable distances between towns in the Karoo, those without a sense of the heritage and culture connected to the open lands may perceive an air of emptiness and wasted space. Thus, the developers overlooked the historical significance of the open lands and trivialised the historical connections between the indigenous people of the Karoo and their land. They disregarded the traumas linked to land dispossession and the repeated violent displacements of the Karoo natives, who were driven from their productive land and reduced to the roles of servants and slaves by British colonial settlers (Burnett, 2021). The legacy of these experiences still endures within the Khoi and San communities. Any intrusion on their land, regardless of its productivity, may be seen as an attack on their heritage. The indigenous inhabitants take pride in the vastness and openness of the region. While we view it as open, unproductive land, they consider it a useful space that connects them to their ancestors. The extensively unoccupied spaces between small towns and villages in the Karoo provide essential grazing land for sheep farming activities, which is more than just the only source of livelihood in the communities, but also a culture and a way of life, which, if taken away, would be equivalent to taking away the air that they breathe. Moreover, the heritage and geology of the Karoo landscape, richly endowed with ancient fossil deposits, render it unique and sacred to the local inhabitants (Walker, 2019).

It is not surprising that the implementers of the SKA project view the acquisition of 134,000 hectares of land, where the 133 SKA receptors will be planted, and its conversion into a national park, as a positive development (NRF|SARAO-Northern Cape Socio Economic Development Report, 2022). The implementers of the SKA project appropriated about 42 farms from sheep farmers around the towns of Carnarvon, Williston, and Vanwyksvley to accommodate the antennas that constitute the SKA telescope. The land was declared a National Park and handed over to the country's park management agency to manage as a national asset. This is viewed as a positive development, while the area's inhabitants perceive it as a form of land dispossession and an erosion of the Karoo heritage. This perception is exacerbated by the fact that residents are denied access to the park due to radio frequency restrictions at the SKA site. This is an indisputable example of a failure to negotiate common developmental objectives with the local society.

Beyond the economic form of development seen in instruments like the FAST, notwithstanding that such developments are rare, it is common for the technological and scientific developments associated with Big Science projects to have a broader impact on human development. Technological developments such as Wi-Fi and the World Wide Web accrue from large-scale infrastructure projects (Gastrow & Oppelt, 2018). The precursor to the SKA telescope, the MeerKAT, is already revolutionising the Big Data space with one of the fastest computers in the world developed to handle the massive data generated by the telescope (Perkins et al., 2021). However, negotiating the divergent views of development and social value within the contested central Karoo terrain is a delicate endeavour; as such, a strong case, backed by relevant, tangible, and sustainable development efforts, needs to be made for the existence of the SKA project in the Karoo.

Autio et al. (1996) believe that if such projects do not explicitly demonstrate their immediate and long-term value to the local communities, they run the risk of political

pushbacks and resentment from the communities, thus threatening their legitimacy. Cruz (2019) has cautioned that even infrastructure projects that have clear economic or social development objectives can still experience community resistance and even ignite social conflict if they do not embrace the local people's conception of development, especially in complex societies. Pockets of such incidents have been prevalent against the SKA in the Karoo.

From a humanistic paradigm, sustainable social value prevails when society is content, feels protected, and its rights and dignity are respected (Vázquez-Maguirre, 2020). Humanistic principles applied in economic activity dictate management practices that honour human dignity; thus, developing sustainable social value is linked to the restoration, protection, and promotion of human dignity (Vázquez-Maguirre, 2020). Dignity-based human interactions should uphold humanistic principles rather than traditional profit-seeking approaches.

In a traditional profit-driven environment, human beings are viewed as resources for production, akin to the equipment and machinery used in the company. Principles and decisions regarding engagement with individuals in an environment that perceives them merely as resources will lack the empathy and genuine connections essential for creating value for people. A humanistic environment designed to provide value for individuals should rely on values and virtues in decision-making, guided by active engagement with stakeholders (Aguado & Retolaza, 2020; Della Lucia et al., 2021; Dierksmeier, 2016), which will ignite positive change at a systemic level (Wasieleski, 2021).

Reconciling the development requirements of a large-scale scientific infrastructure project with those of the local community calls for the recognition and application of humanistic principles in the management of the project. Vázquez-Maguirre (2020) believes that social entrepreneurship serves as a useful platform that allows for the integration of humanistic principles in management. Social entrepreneurs are foremost concerned with the overall well-being of society and the ecosystem within which society can thrive, especially in

rural and impoverished communities (Pirson, 2019). The towns surrounding the SKA project in the Karoo can be considered to be impoverished due to the low economic activity. To gain legitimacy while ensuring the sustainable development of social value in the communities of Carnarvon, Williston, Vanwyksvlei, and Brandvlei, the SKA project and similar large-scale scientific infrastructure projects should infuse humanistic management principles integrated within a social entrepreneurship approach in their interactions with the local community, which will allow the project to infuse socioeconomic development imperatives within their area of implementation. The approach will enable a large-scale scientific infrastructure project, commonly referred to as a Big Science initiative, to implement socioeconomic and enterprise development initiatives as an additional mandate.

Within this framework, this study seeks to guide and refine humanistic management strategies with the primary aim of creating a model for humanistic social entrepreneurship. This model will steer future interactions between large-scale projects and communities to generate sustainable social development value, thereby enhancing the legitimacy of Big Science initiatives.

Statement of the problem

The Dichotomy of Developmental Objectives

Autio et al. (1996), Gastrow and Oppelt (2018) and Cruz (2019) have drawn our attention to the state of affairs whereby Big Science initiatives are failing to align their developmental objectives with those of the local communities in which they operate, leading to the loss of social legitimacy on the side of the Big Science initiative, while the resultant effect on the community would be the loss of hope and despair due to unmet expectations. The problem to be addressed by this research stems from this disjuncture, whereby there is a lack of synergy between the developmental objectives of the Big Science initiative and what the community

expects to be the development that brings value to them as residents of the area in which such a project is situated.

Big Science projects often compete with societal development needs for public funding. Decisions to invest public funds in Big Science projects should, therefore, be based on more stringent justification than just a mere promise of social development anticipated from their scientific and technological advancements. Proof of real and tangible impact at the community level should be considered the minimum standard. The challenge, however, is that a glaring gap exists in the identification of appropriate and relevant societal developmental objectives, as shown in the literature quoted above. The absence of clearly defined local development objectives makes it difficult to determine the necessary interventions required, leading to further difficulties in identifying suitable tools to measure the direct impact on society.

The lack of a common understanding and approach to the concept of local development, how it is achieved, coupled with the lack of clear methods of measuring impact, leads to a misdiagnosis of what a Big Science initiative can and should do to impact its local community. Several researchers who examined the relational dynamics between the implementation of Big Science projects, including the SKA project, and the socioeconomic development trajectory in communities surrounding these projects have largely discovered a paradoxical misalignment between what the project implementers consider to be development and what communities envision as their developmental requirements. This has been particularly evident in economically depressed areas such as the Karoo, where the SKA project is situated.

A study by Butler (2018), which aimed to understand how the people of Carnarvon perceive the scientific and developmental goals of the SKA project in relation to their socioeconomic circumstances, found that while the staff of the SKA project and other personnel directly involved with the project were enthusiastic about the SKA's science agenda, vibrantly expressing sentiments of hope and belief that development in science would

seamlessly lead to socioeconomic development, they could not, at that time, clearly explain the link between science and development. The residents, on the other hand, showed no interest in the scientific goals of the project; their dominant perspective was that the project would help to develop their area by providing jobs, economic opportunities, and lifting them out of their impoverished living situation. These competing views of development suggest that the idea that implementing Big Science projects inevitably results in development may not be a universal truth; it rather exists only as a form of justification for public acceptance. The reality is that it is difficult to define the nature of development, from a Big Science initiative point of view, that has the potential to impact local communities, hence the difficulty in identifying specific development outcomes that could be achieved through the implementation of the SKA project.

To further illustrate the divergence in the framing of the concept of development, the project implementers would place a high premium on education, thereby investing energy and resources in enhancing the educational enterprise in the area. The rationale behind these efforts is that the Big Science initiative would require scientists and engineers to sustain the project over the longer term; as such, it makes sense for them to focus on efforts that produce those skills. This form of logic illustrates the fact that the developmental approach within the project implementers is not aligned with the immediate developmental needs of the local community. This approach is illustrated in Chinigò and Walker's (2020) concept of "sacrifice Zones". In this concept, the area hosting the SKA project, the culture, aspirations, and the needs of the people are sacrificed for the urgency of the knowledge enterprise. The expected development from the residents' point of view would include programmes that impact on their immediate living conditions, such as creating direct jobs and business opportunities, as this would improve their livelihoods.

This lack of synergy regarding the approach to the concept of development often leads to tensions, thereby threatening the social legitimacy of the Big Science project. This situation raises the first problem addressed by this research: the social legitimacy of Big Science initiatives as recipients of fiscal funding. This study aims to solve the problem by bridging the gap between the developmental mandate of Big Science initiatives and the developmental requirements of the local communities.

The work of Adams et al. (2023) further illustrates the extent of the problem posed by the lack of synergy between Big Science's understanding of development and local communities' perspectives. In the OECD report examining how the implementation of the SKA project can integrate socioeconomic development, Adams et al. (2023) proposed six pillars believed to support stakeholder engagement in a framework referred to as the Stakeholder Value Framework. The six pillars talk to issues of scientific output, institutional transformation, knowledge economy, science engagement, technology development, and a culture that responds to national opportunities. None of these factors directly relate to the local developmental objectives that could improve the lives of the local people.

The work of scholars such as Beck and Charitos (2021), Chinigò and Walker (2020), Gastrow and Oppelt (2018) and Walker (2019) made a significant contribution to the debate and contestation around the contribution of Big Science in adding developmental value to communities. All these works agree that there are problems when it comes to local development objectives and expectations measured against the developmental objectives and science goals of Big Science initiatives such as the SKA. This situation encapsulates one of the problems that this thesis aims to address.

In summary, the problem resulting from the dichotomy of developmental objectives is that communities affected by the implementation of Big Science initiatives do not derive direct social benefits, and in some cases, they are left even poorer than before the project arrived. Put

differently, the investments made into Big Science initiatives by the government through the disbursement of public funds do not benefit societies, often the underprivileged and impoverished, who are accommodated on their land, which could otherwise be used for other economic activities. This problem, in turn, leads to existential difficulties for the Big Science initiative.

Defining and Measuring Social Value

The misalignment of developmental mandates is closely linked to the absence of a structured framework that could be applied in identifying the nature of social value to be delivered by a Big Science initiative within its local community. This also leads to the inability to accurately measure the impact of programmes that are meant to drive development in the community. This problem is amplified in a study by Ha-Duong et al. (2016). The study assessed conditions in hydropower projects in Vietnam and found that, although Vietnam invests comparatively much more in infrastructure development than most East Asian economies, it experiences more challenges, largely due to inefficiencies in project implementation, which stem directly from its inability to assess social impact. The observed neglect of social impact issues, while prioritising other areas such as environmental impact, leads to social problems such as the unfair treatment of ethnic minorities, unresolved land disputes, and disproportionate compensation for resettlements. These issues further lead to increased social inequalities while also creating implementation difficulties for the project. Similar conditions exist in the Karoo, where the SKA project operates. The study by Binneman and Davis (2021) highlights some of the difficulties experienced by the SKA project in relation to its land acquisition programme and how it interacts with the indigenous communities, like the Sam and |Xam communities. These two studies highlight the painful reality that Big Science projects fail to measure or clearly articulate their impact on the local communities, and this becomes a source of conflict between the project and the community.

Chinigò (2018) observed that the SKA has delivered some benefits to its local communities, citing programmes such as the SKA Human Capital Development Programme, which offer bursaries and training opportunities for youth scientists and engineers, fostering expertise in fields like big data and computing, inflow of considerable international investment into the Karoo and other developments in the technological and innovation front, however, measuring the direct impact of these developments in the local community has not been possible, as observed by Gastrow and Oppelt (2018).

Catalano et al. (2016) looks at the issue around the methods of measuring social impact. Their study highlights the difficulties in quantifying socioeconomic impact due to complex stakeholder dynamics, pointing out that there is a glaring lack of a standardised measurement approach to quantify the direct impact of these developments related to Big Science initiatives. The inability to quantify the impact hinges on crucial policy decisions in the establishment and funding of Big Science projects. In attempting to intervene in the space, Crosby (2012) and Florio (2019) proposed social impact measurement frameworks that incorporate the cost-benefit analysis approach; however, they admit that the approaches are limited as they do not incorporate sufficient measures to account for non-economic impact.

This thesis is designed to intervene by designing an impact measurement approach based on the concept of Social Value as implemented by Big Science initiatives.

Big Science Funding Policy

Weinberg (1961), as observed by Withers (2021), believes that Big Science initiatives should not be prioritised for public funding over the delivery of essential services for human needs, as they do not offer value to society. Butler (2018) stopped short of arguing that Big Science projects such as the SKA should not be funded if the world is still plagued with hunger and poverty. These are radical monistic views, as human development cannot be viewed only from a single lens, better still, the contributions of Big Science initiatives to human

development at a global scale cannot be downplayed. However, the fact that there is even a consideration of this radical approach, where Big Science projects are torpedoed until the world is developed in its entirety, is an indication of the dilemma that exists at the policy level where the allocation of public funds is concerned.

The issue of policy uncertainty about the funding of Big Science initiatives is a direct result of the failure of these projects to demonstrate their contribution to social development at a local level. The main problem here is that implementers of Big Science projects, such as the SKA, believe that the science and engineering goals of the projects automatically lead to development, and to some extent, are even more superior to the bread-and-butter concerns of the people. To some extent, this assumption could be true, given that research and development drive human development. Furthermore, in pursuit of the scientific and engineering goals of the science projects, there are often several technological developments that contribute to innovation on a global scale (Beck & Charitos, 2021). However, no study has ever confirmed the direct impact of these projects in terms of improving the lives of the local people (Gastrow & Oppelt, 2018).

It becomes inescapable that policy decisions on funding these projects remain at the whims of political machinations. The Superconducting Super Collider (SSC) in Texas, as an example, was cancelled in 1993, citing the budget escalations as the major reason for its cancellation. Many people viewed the cancellation as an unfortunate loss of scientific opportunity for the USA. On the same day when the decision to cancel the SSC was taken, Congress approved funding for the International Space Station with a budget of nearly four times the funds required by the SSC (Withers, 2021). This clearly shows that the cancellation of the SSC was not entirely based on financial considerations but was a political decision that disadvantaged a worthy science project due to the lack of information on its direct societal

impact. It could not be doubted that had the SSC project made clear and tangible proposals of the direct benefits its activities would yield to society, its funding could have continued.

Similarly, the government of South Africa stopped funding the Pebble Bed Modular Reactor (PBMR) in 2010, and the reasons for mothballing the project were touted to be largely economic; however, it could still be safely assumed that if the project were demonstrating tangible societal returns at the time, the government would have pumped more money into its continuity.

Logically, it would be financially prudent to invest public funds in an endeavour that has clear prospects for societal development while achieving its intended mandate. The advancement of the knowledge enterprise is the principal mandate of Big Science initiatives; however, because these projects receive funds from the fiscus, they should also assist governments in addressing societal challenges and delivering on their service-rendering imperatives. The justification for funding several scientific research projects in the era of the Apollo mission was their contribution to defence capabilities. The telecommunications network research conducted by the Advanced Research Projects Agency Network in the 1960s was funded to the tune of billions of dollars by the US Department of Defense due to its contribution to defence technologies (Florio, 2019).

The Director of Fermilab, Richard Wilson, when asked about the social value of the particle accelerator, remarked that:

> "it has nothing to do with the security of the country…it has to do with the respect with which we regard one another, the dignity of men, our love for culture. It has to do with: are we good painters, good sculptures, good poets? I mean all the things we venerate in our country and are patriotic about. It has nothing to do with directly defending our country except to make it worth defending." (Florio, 2019, p.5)

This justification made it clear that building a cohesive society that prides itself on its culture and reverence for the things that build patriotism in the country is top of the agenda. This is about social development more than science. Wilson recognised that, while doing the science,

Fermilab should also strive to build a cohesive society. This justification is worthy as it elevates the value of knowledge and national pride to the level of national cohesion and security.

The cost-benefit analysis theory is somewhat useful in the evaluation of publicly funded projects in terms of informing funding policy. However, the disjuncture is that the CBA framework considers the shadow prices of unintended benefits related to the mandate of the project. For instance, Basti and Madadizadeh (2021) found that a cost-benefit analysis of the National Hadrontherapy Centre for Cancer Treatment (CNAO) in Pavia, Italy, showed that the facility delivers positive benefits to society in the form of long-term health benefits. The CNAO is privileged since it is a medical science facility that provides health benefits as its social value. Big Science initiatives whose scientific focus is on Astronomy or Physics do not enjoy the same privilege, as there is no direct social impact flowing from their work, even though scientists and funders may still justify their efforts in terms of technological spillovers, knowledge creation, training, and other resultant long-term innovations. This is a universalist logic of development, as espoused by Gastrow and Oppelt (2018), and it fails to take into account the local developmental imperatives such as the direct effect of employment, infrastructure, supply chains, local innovation systems, and direct development interventions (Gastrow & Oppelt, 2018). The disconnect between global developmental considerations and local needs inevitably results in tensions that impact the successful implementation of the project, which could, in turn, jeopardise or negatively impact funding policy. This research aims to solve this problem and intervene in the policy space to have clear policy directives governing the funding of Big Science initiatives.

Cruz (2019) found that, among other causes, the biggest source of conflict between local communities and big science infrastructure projects is the lack of consideration of the needs of the population. However, his proposed solution to these challenges, which this paper vehemently opposes, is to toughen the laws governing the implementation of these projects.

Summary

This section sets out the outline of the research problems that this research project intends to address. Two main problems are emerging within the space of Big Science initiatives. The first problem stems from the disagreement between the implementers of Big Science initiatives and the local people residing in areas closer to where the projects are being implemented. This problem, on the one hand, creates existential and sustainability threats to the initiative, while on the other hand, it perpetuates socioeconomic depression and loss of hope in the affected communities. The second problem relates to the murky policy environment related to the funding of these initiatives. The disjuncture between what implementers of Big Science initiatives consider as the development of social value and what the communities perceive to be the nature of the social value that local communities believe they should derive from these projects is well documented in this section. This misalignment of developmental objectives and the earlier discussed situation of the lack of evidence of the impact of these projects in society and how they contribute to socioeconomic development creates a vacuum in funding policy, as governments are unable to justify the value derived from investing in Big Science initiatives, thereby resulting in funding that depends on political decision-making rather than clear policy motivations.

The resultant effect of the lack of a clear funding policy for Big Science initiatives is that government funding could be directed to projects that may not be properly structured to assist the government in achieving its national development goals, thereby leading to economic and political instability in the country. The other side of the problem, which is also linked to the issues related to the developmental objectives and the social value measurement problem, is that governments may not necessarily know whether they are deriving real value from investments that they make into Big Science initiatives. This research seeks to intervene to mitigate the disjuncture between the intended objectives of large science research infrastructure

projects and the developmental expectations of the local society directly affected by the implementation of such projects, thereby influencing policy direction in the funding of these projects.

The main problems that gave rise to this research project, therefore, are (1) the dichotomy of developmental objectives and (2) the lack of measures to define and measure social value, and (3) the lack of a clear funding policy, which is exacerbated by the lack of guarantees in the form of returns on investment into the Big Science project. These problems affect decision processes in the establishment, funding and implementation of Big Science initiatives.

Purpose of the Study, Research Aims, and Objectives

Purpose

This mixed-methods study aims to develop a framework to integrate local societal development mandates into the planning and execution of Big Science initiatives. The development of this framework or model will help to bridge the gap between the global knowledge development mandates of these projects and the localised developmental objectives of the impoverished local people, thereby increasing their justification for public funding and creating harmony and acceptability within the communities in which these projects are implemented.

The problematic environment associated with the implementation of Big Science initiatives, where the developmental objectives of the project and the development expectations and aspirations of the local communities do not align, which leads to a vacuum in the funding policy of these projects, could be addressed through proper planning, consultation, and ensuring that initiatives within the implementation regime of the Big Science initiative aimed at addressing socioeconomic challenges are aligned to the Sustainable Development Goals. The main purpose of this study is to bring these aspects together, where an implementation

framework or model will be developed to act as a bridge and a consultation mechanism to construct a common appreciation of the developmental objectives.

The study will essentially serve two critical purposes: one is to increase the legitimacy of these projects while addressing the policy space related to the funding of Big Science initiatives, and the second would be to ensure that the implementation of Big Science initiatives results in impactful, relevant, and measurable sustainable social value within communities that are affected by their existence and implementation.

The study will qualitatively observe the views of the local community surrounding the SKA project to understand what they consider as developmental value according to their standards. Quantitative methods will then be used to gauge the prevalence and extent of the social value, as defined from the local community's perspective, and also measure the extent of sustainability of this value.

Aim of the study

The broader aim of this study is to promote sustainable socioeconomic development in rural communities using large infrastructure projects. The SKA is used as a test case in developing a framework for humanistic management in the context of Big Science initiatives within a social entrepreneurship environment. The framework will enhance the planning and execution of socioeconomic development initiatives implemented by the project in an attempt to develop and uplift the rural communities of Carnarvon, Williston, Vanwyksvlei, and Brandvlei. A framework for the implementation of social value will be developed. It is expected that this framework will guide the process of aligning developmental value between Big Science objectives and local community expectations.

Objectives

Based on the aim of the study, which is to promote sustainable social value using a large-scale scientific infrastructure project, the study will address three main objectives. The

first objective relates to the nature of social value created by the SKA project in the identified areas. Catalano et al. (2016) observed that the primary cause of tension between Big Science initiatives and the local community is the lack of clarification as to what constitutes impact. As discussed earlier, Big Science initiatives define impact in terms of scientific and educational impact, pushing social intervention to the periphery, while the local community is expecting social impact (Chinigò & Walker, 2020). Catalano (2016) proposed that, in order to clearly define what constitutes relevant social value, a comprehensive definition of social value that encompasses all elements of societal changes that are relevant to the stakeholders should be developed. It is for this reason that the nature of the social value in Carnarvon is defined from the perspective of the people of Carnarvon. This approach will help to bridge the gap between the divergent views of social development as held and espoused by the project owners and the developmental aspirations of the local people.

The second objective relates to the extent of sustainability of the social development delivered by the SKA project in the community of Carnarvon. Adams et al. (2023) as well as Binneman and Davis (2021) believe that the SKA has brought significant advancements and opportunities through several programmes implemented in the Carnarvon area; however, the impact and sustainability of these programmes need to be examined. Going back to the earlier example of the FAST telescope, the Pingtang Astronomy Town, which was developed as a tourism hub for the telescope, will be a lasting legacy of the project. Its sustainability is centred around the tourism income and the resultant job opportunities for the local people, but most importantly, it will continue to thrive and grow because it is anchored on the needs and aspirations of the local people. In the case of the SKA project, however, questions as to the sustainability of the socioeconomic development initiatives in the area abound.

This thesis will develop quantifiable indicators of the sustainability of the social value as identified or defined by the community, which are aimed at objectively confirming their

impact on the lives of the people. This will aid in testing the sustainability and impact of the programmes in the area.

The third objective relates to the specific approach in which sustainability can be entrenched in the town. A model centred on the concepts of humanism and social entrepreneurship, applicable to the SKA project and other similar large infrastructure projects, will be developed. Sustainability is best achieved when the United Nations Sustainable Development Goals are used as a guiding framework. The SDGs provide a framework for key interventions and actions that are necessary for sustainable development, such that when a business model is organised in such a way that it aligns with and supports the achievement of the SDGs, it will be able to provide solutions to the recipients of its development programmes while also achieving its business goals (Pedersen, 2018). The sustainability model to be developed should therefore incorporate the SDGs.

In addressing these objectives, this thesis will have to innovate and develop measurable parameters for the concept of social value. One of the issues highlighted by Gastrow and Oppelt (2018) relates to the lack of evidence pointing to the impact of Big Science initiatives on the socioeconomic development of the local communities where these projects operate. It is hoped that in meeting the objectives of this study, the issues of measurement of social value as a measure of impact in social development will be addressed.

Furthermore, the government's funding policy and implementation of large projects will benefit immensely from the proposed model. The large projects will also benefit in terms of fulfilling their inherent and socially expected development mandate of bringing about sustainable positive change in communities within which they operate, especially rural communities, thereby justifying their legitimacy.

In summary, the main objectives of the study are to:

i. determine the nature of the social value created by the SKA project in the identified areas,

ii. evaluate the extent of sustainability of the social value created in the community, and
iii. use humanism and social entrepreneurship in Big Science initiatives to entrench socioeconomic sustainability.

Research Questions and Hypothesis

Research Questions

This study will answer three interconnected research questions. In the first instance, this thesis will concern itself with the nature of social value in Carnarvon. It is important to obtain a clear understanding of what the community perceives to be their social value, in other words, to understand what specific elements of development they anticipate for them to have a sense of adequate development that responds to their basic needs. Finding out what the community believes to be their social value is crucial to addressing the problem that this thesis is attempting to tackle, which is the disjuncture in the views about development between Big Science projects and the local community in which they operate. The first question to be answered in this thesis will relate to the nature of social value as perceived by the people of Carnarvon.

The second research question relates to the evaluation of the social value as described by the community. The thesis will test the existence of the social value as described by the people of Carnarvon and further gauge the extent of prevalence of the social value. Determining the existence of social value and the extent will shed light on how the social value is created, if it exists, or what prevents its existence if found not to exist. Answering the research question dealing with the existence of social value will begin to shed light on how the SKA project could create social value within its area of existence and further shed light on aspects of the sustainability of such social value. This then leads to the third research question that deals with how a Big Science project can contribute to the sustainability of social value within an economically depressed community such as Carnarvon. In the context of the Sustainable

Development Goals, sustainability is predominantly framed in terms of environmental preservation, with economic development viewed as a process that must be regulated and monitored to avoid environmental degradation. This thesis will argue that sustainability can and should be viewed from multiple angles, with the environment as a component of the whole. The focus and emphasis in this thesis is on socioeconomic sustainability.

In summary, the three research questions to be answered in this thesis are:

RQ1: What is the nature of the social value expected by the people of Carnarvon from the SKA project?

RQ2: To what extent has the social value, as defined and anticipated by the local community, been implemented in the local community?

RQ3: How can the SKA project apply humanistic management principles in its socioeconomic initiatives to achieve sustainable social value?

Hypothesis

The approach in this research project would be first to explore the nature of social value as defined by the communities covered by the study. The initial part of the study will be exploratory, whereby the community's understanding of social value is explored, and the specific elements considered as determinants of social value, from the community perspective, are identified. This process will follow qualitative approaches. The identified aspects of social value will form the subject of enquiry in the second leg of the research, where quantitative methods are used to quantify the social value. Indicators of social value will be developed and measured as independent variables in the quantitative analysis. It is hypothesised that the implementation of the SKA project would have created sustainable social value and addressed some of the United Nations Sustainable Development Goals; thus, the null hypothesis in this study is that there is no sustainable value created by the implementation of the SKA project in

Carnarvon. This main hypothesis will be divided into five sub-hypotheses that collectively address the main hypothesis.

Nature and Significance of the Study

Nature of the Study

This study is designed as exploratory mixed-methods research as it employs both qualitative and quantitative research strategies. The approach will be to use the SKA project that is being implemented in the Karoo, closer to Carnarvon, Williston, Vanwyksvlei and Brandvlei, as a test case. Although the focus is on the SKA project, the study itself will not necessarily assume a case study design, as its purpose is not necessarily to conduct an in-depth study of the SKA as a project but rather to use the project as a test case and a framework within which the implementation of socioeconomic development initiatives is being tested. Levy (2018), Priya (2021) and Schoch (2020) agree that a case study design will involve the detailed study of a particular case of interest, usually to describe, explain, or interpret the specific phenomenon of interest. The same scholars further agree that the common methods applied in a case study design would be qualitative in nature. This category of research approach, as described, does not fit the purpose of this study. However, this study would have some aspects of a case study. Referring back to Levy (2018), it is accepted that a study could be a case study if its purpose is to examine a specific case to develop generalised theoretical propositions that can be tested further. Although this study has a similar element of generalised theoretical propositions in the intersection of humanism and social entrepreneurship and their role in developing sustainable social value and given that one of the objectives of this study is to examine the socioeconomic development initiatives of the SKA project to understand how a Big Science initiative can create social impact in its local community, it cannot outright be classified as a case study. Based on that understanding, the researcher recognises that this study

has an element of a case study while the overall methodological strategy is premised on a mixed-methods approach.

The study will use qualitative methods to first explore how the local people within the area of operation of the SKA project frame and understand their social value. Examining the unique understanding of the social value of the local people is necessitated by the understanding that social value is contextualised and framed according to the local developmental needs. The study must get to the bottom of what the community perceives as constituting their social value arising from the implementation of the SKA project. After establishing the nature of social value as defined by the local people, quantitative methods will be used to examine the existence of the defined value and also gauge the extent to which the social value exists, as well as determine the level of sustainability of the identified value.

Noting that research is conducted to reveal the truth about a phenomenon or a situation and construct new knowledge (Walliman, 2010), and further understanding that the epistemology of knowledge is located within a particular philosophical paradigm (Raftopoulos & Machamer, 2012), it naturally follows that conducting research becomes a philosophical exercise. The nature of knowledge is located within two main philosophical schools of thought. One is positivism, which sees knowledge construction as a rigid, fact-based, and value-free process (Ryan, 2018), while the other is constructivism, which sees knowledge construction as a complex subjective process of seeking meaning and understanding within multiple realities (Krishnamoorthy et al., 2021). Positivism is associated with the number-crunching quantitative research method, while constructivism is associated with qualitative research (Yannis & Nikolaos, 2018). Some researchers, specifically ideological purists, believe that meaningful knowledge creation can only happen exclusively within either of the ideological positions and never in both at the same time (Green & Baan, 2007).

Nonetheless, the researcher in this case believes that the age of singularism, where a unilateral approach to knowledge creation is preferred, should be discarded; hence, the mixed methods approach is preferred. This aligns with Terrell's (2012) view that mixing methods in a single research project lends quality and rigour to the study; as such, a dual method approach will be employed. The use of qualitative methods, on the one hand, is used to make meaning of social value within the context of the Karoo communities, as the qualitative method is best employed in research that seeks to establish the subjects' insider perspective (Bazen et al., 2021). The other part of the research seeks to quantify sustainability while simultaneously applying qualitative methods to understand the role of humanistic principles in the identified projects; this, therefore, calls for the use of both qualitative and quantitative approaches. The overall appropriate approach will be to employ an integrative strategy (Åkerblad et al., 2021), iterating between qualitative and quantitative approaches at the philosophical, theoretical, data collection, and analysis levels.

Participants

The focus area of this research is the local communities adjacent to the SKA project. The SKA is a radio telescope that will ultimately consist of about 197 15m-diameter parabolic antennas that are electronically linked as an interferometer (SKAO, 2025). The core of the telescope consists of about 80 antennas distributed over a square Kilometre area, and the main data processing centre is situated centrally between the towns of Carnarvon, Williston, Brandvlei, and Vanwyksvlei. Due to their proximity to the core of the telescope, the four towns have been the focus of the socioeconomic development initiatives of the SKA. The main activities of the project are based in Carnarvon. Carnarvon hosts the engineering operations centre for the telescope, and it is also the centre of operations of the SKA's community stakeholder engagement office managed by the South African Radio Astronomy Observatory (SARAO). The majority of people benefiting from direct involvement in SKA activities are

based in Carnarvon. Given that Carnarvon is the main activity centre for the socioeconomic development activities of the SKA, it will form the main focus area for this research. Other reasons for choosing Carnarvon as the main focus are mainly for practicality, as the town is easily accessible and convenient from a travel and accommodation perspective when conducting research. The target population will, therefore, be the residents of Carnarvon.

In the mixed-methods approach, the group of participants who will be engaged to provide the qualitative data will be adult residents of the town of Carnarvon. A representative sample will be identified using a probabilistic sampling method. The population that will be targeted to provide the quantitative data will be the people who participated in the SKA socioeconomic development programmes. These people would have recently had a close encounter with the staff from the South African Radio Astronomy Observatory.

Methods

An exploratory mixed-methods approach will be employed in this study. The qualitative data will be collected through open-ended interviews that will be conducted with a sample of the residents of Carnarvon. The data will be qualitatively analysed to detect aspects that are considered determinants of the social value in the community. The identified factors will be built into the questionnaire and tested through a survey with the identified sample to gauge their existence and the extent to which they exist in the area. A survey using a Likert Scale questionnaire will be administered to the sample of the population of people who participated in the SKA socioeconomic development initiatives.

Significance of the Study

This study is significant as it will solve several problems related to the funding and implementation of Big Science initiatives. Firstly, the problem of legitimacy, as espoused by Autio et al. (1996) and Cruz (2019) will be addressed by the model developed in this study, as it will provide a framework for the integration of local developmental mandates of these

projects at the conceptual and planning phase. The problem identified by Autio et al. (1996) and Cruz (2019) is that if these projects do not take into account the developmental needs of local communities within which they are implemented, they run the risk of political pushback and derailment. The outcomes of this study will mitigate that divide and ensure that there is a consensus between society's developmental expectations and the objectives of the projects.

The second problem is that of funding, as highlighted by Withers (2021). Since the societal development value of these projects is often not clear from the beginning, funding policy mostly relies on political machinations, possibly disadvantaging otherwise worthy projects. The results of this study will enable Big Science infrastructure projects to make a strong case for their funding, justified by the clear social value that will accrue from their implementation.

Finally, the outcomes of this study will ensure that communities fully benefit from the humanistic approaches proposed as implementation mechanisms for social development initiatives. The study will propose an approach that will ensure that social development programmes that are relevant, worthy, and sustainable are implemented on the back of Big Science infrastructure programmes. It has been established earlier in this dissertation that there is a general expectation that large infrastructure programmes would yield positive development in the societies in which they are implemented (Cruz, 2019 and Mansell & Philbin, 2020). However, such development is viewed from a global development perspective, considering knowledge development and other peripheral benefits such as innovation and technology spinoffs; however, the local communities expect immediate and impactful development, such as job creation, economic value, and service delivery. The outcomes of this study will have an impact on the implementation level of Big Science initiatives to ensure that humanistic management principles are applied to realise impactful value to the local communities. This is especially relevant to rural communities such as those bordering the SKA project in the

impoverished Central Karoo of South Africa.

In summary, the significance of this study lies in its approach of combining Humanism as a management philosophy with Social Entrepreneurship as a guiding approach to socioeconomic intervention to advance socioeconomic development using Big Science initiative as the special purpose vehicle. Humanism prioritises a human-centred business approach, while Social Entrepreneurship provides the basis for specific interventions and strategies that are oriented towards the delivery of social value. Combining the two philosophical paradigms in a Big Science setup, as a platform for social intervention, guarantees the accrual of socioeconomic impact.

Innovation

The study's innovation and contribution relate to the Big Science development discourse. Mainstream research has focused on the question of the role of Big Science initiatives in driving social impact, thereby questioning the investment of public funds in undertakings that lack social impact. The cross-cutting themes emerging from these studies suggest that:

- Big Science initiatives justify their existence and funding by claiming social impact and development,
- Communities whose lands accommodate Big Science initiatives are not realising relevant and impactful development,
- Big Science initiatives are unable to demonstrate the specific impact they make in communities,
- There is a misalignment between the mandates of Big Science initiatives and the imperatives of local development. To address the issue of mandates further, this thesis will further develop and substantiate the proposition that Big Science initiatives carry

the mandate of social development by virtue of the source of funding and the nature of their existence within local communities.

- Lack of meaningful engagement with communities.

This study adopts an innovative approach in responding directly to these issues by:

- demonstrating that Big Science initiatives have the structural proclivity to deliver social impact, using the SKA as a model for Big Science socioeconomic development,
- demonstrating that Big Science initiatives possess an inherent mandate to positively impact local communities.
- defining the concept of development and locating it within the context of local communities
- developing a structured system and approach to measuring social impact, which, for the purpose of this research, is conceptualised and measured as Social Value

At a theoretical level, the thesis contributes to the Social Entrepreneurship identity discourse, defining the concept as a philosophical approach based on the principles of taking action for social good. This thesis provides conceptual clarity at the intersection of social entrepreneurship as a philosophy and social enterprise as a vehicle or system through which social entrepreneurship can be achieved. This thesis argues that social entrepreneurship can and should be applied within a large-scale science initiative setup, with the ultimate goal of providing social value as its primary objective, rather than generating monetary value as in a traditional social enterprise. The theoretical innovation of the thesis is that it brings humanism and social entrepreneurship together within the Big Science space to advocate for social value development.

CHAPTER 2: LITERATURE REVIEW AND CONCEPTUAL APPROACH

Introduction

Big Science initiatives are typically established with extensive budgets allocated by governments. In some cases, they receive support from private interests, but most Big Science funding comes from the public treasury. When public funds are utilised, society naturally expects returns that, at the very least, contribute to their development. In developing countries, citizens—especially those living in socioeconomically depressed conditions—anticipate that every cent spent by their government will help improve their living conditions. Citizens expect their government to provide housing, job opportunities, healthcare, and all other services essential for their well-being. The public would find it unacceptable if the government spent billions of rand to build a scientific instrument that did not demonstrate any immediate impact on their lives. Big Science initiatives, such as the SKA, often struggle to demonstrate tangible and relevant benefits for society, aside from the advantages of knowledge creation and scientific advancement, which do not directly impact the impoverished local populace.

The benefits of Big Science projects are usually assessed using either the social accounting matrix analysis method or the cost-benefit analysis method (Florio & Sirtori, 2014), which ultimately tests the positive contributions of the investments made in the project to per capita growth in Gross Domestic Product. These methods only focus on the economic inputs, which are, in turn, assessed on their economic outputs (Pirson, 2012) whereas outputs relevant to the local community can be gauged by their social impact. The CBA and the SAM methods rely on materialistic aspects of development, while being limited in accounting for the human and social welfare aspects of development (Spitzeck, 2011).

This study seeks to intervene in the space separating Big Science's developmental aspirations from the local social development aspirations. This study will deal with the socioeconomic developments of the SKA project as a Big Science initiative from a humanistic

rather than a materialistic paradigm, thereby ensuring that realistic, impactful, and relevant social development happens at the local level.

Management theory has mainly focused on organisational approaches that prioritise the maximisation of shareholder profits (Dierksmeier, 2016). The individual is viewed as a means to achieve such ends (Pirson, 2019). For example, the primary purpose of employing workers under the profit-driven approach would be to use the worker as a tool for production, being used to maximise profit for the company. In contrast, the opposing view posits that employees are hired so that they can earn a living that helps alleviate their dire circumstances, and in the process, they'll help increase the company's profitability. In the first approach, the company is the central focus, whereas in the second approach, the individual becomes the primary point of emphasis. The profit-driven model tends to overlook the value of the individual as a being with dignity, as such considerations of public interest and social welfare are relegated to the periphery (Pirson, 2019; Vázquez-Maguirre et al., 2019). It is the philosophical premise of this thesis that socioeconomic development that is devoid of human dignity and public interest cannot claim to create value in society. A Big Science initiative adopting this approach runs the risk of social illegitimacy, which may lead to public alienation and disruptions.

In attempting to solve the problem of project alienation and dwindling public support, and even revolt in extreme cases due to unclear social benefits associated with the implementation of the Big Science initiative, as observed by Cruz (2019) it is often the case with Big Science initiatives that are not aligned with the needs or expectations of the local people. This study will explore the role of humanistic management in the implementation of socioeconomic initiatives to ensure social value and sustainable development in the affected communities, which are largely poverty-stricken.

A project implementation and management model that integrates human dignity offers opportunities for transformative change that result in social value (Srivastava, 2020). As

strongly argued by Pirson (2019), a management theory paradigm that focuses on human dignity will have a stronger connection to social welfare and collective development; hence, the focus of this study is the exploration of ways to create sustainable social value through humanistic approaches embedded within a social entrepreneurship model.

This chapter seeks to systematically build a conceptual framework anchored on the concepts of humanistic management and social entrepreneurship as the guiding framework for its implementation. The construction of the theoretical framework will be preceded by a detailed analysis of the literature in this field to set the scene for the theoretical approach.

Literature Review

Scope of Literature Review

In the pursuit of the objectives of this research, which are to determine the nature of the social value created by the SKA project in the identified areas, evaluate the extent of sustainability of the social value created in the community, and create a social value sustainability model that in informed by the concepts of humanism and social entrepreneurship, literature that provide a thorough view of the research landscape in areas that responds to these objectives will be analysed. The specific areas, as reflected in the objectives outlined above, are research in the subject area of social value within the confines of a Big Science project, measurement of social value, and humanism and entrepreneurship as a lens through which social value can be seen. This section will thoroughly engage with the relevant academic works within the identified research areas to lay the basis for academic intervention in order to achieve the stated objectives.

A comprehensive literature search was conducted to identify academic work on the socioeconomic impact of the SKA. Searches were performed in various databases, and full-text, peer-reviewed articles were selected. There were no restrictions on the period of

publication, as this approach aimed to uncover all relevant research in this field. Research publications that had the SKA project, big science project, large science infrastructure project, or mega science infrastructure project as the main subject were targeted. The additional focus areas of the research should be on socioeconomic development, social impact, or social development. Searches were conducted in the various databases using a Boolean string to ensure that the returned results are confined to the targeted subject. Different combinations of phrases were used in the Boolean string to ensure that all the subject fields of interest were covered. Below are examples of some of the Boolean strings as they were entered into the search bars of the various databases.

("Square Kilometre Array" OR SKA) ("social impact" OR "social development" OR "socioeconomic development") "South Africa"

In this string, the phrase Square Kilometre Array was enclosed in quotation marks to ensure that the full phrase is searched. The Boolean operator “OR” was used between the phrase and the acronym to ensure that articles that only referred to “SKA” are also identified. However, accepting the acronym meant that articles that had the acronym but referred to something other than the Square Kilometre Array project would also be returned. The irrelevant articles would be sifted. To ensure that the returned articles deal with the subject of social impact, social development, socioeconomic development, or social value, the phrases were put in parentheses, separated by the Boolean operator “OR” to ensure that any of the phrases are matched, while the phrases are put in quotation marks so that they are matched exactly as they are. South Africa was enclosed in quotation marks outside the parentheses to ensure that research specific to the South African context is identified.

Multiple variations of the Boolean string were used for a comprehensive and in-depth search. More examples are given below:

("Square Kilometre Array") ("social impact" OR "social development" OR

"socioeconomic development") "South Africa"

("Mega Science Project") ("social impact" OR "social development" OR "socioeconomic development")

("Mega Science infrastructure") ("social impact" OR "social development" OR "socioeconomic development") "South Africa"

("Large Science infrastructure") ("social impact" OR "social development" OR "socioeconomic development")

("Large scale research infrastructure") ("social impact" OR "social development" OR "socioeconomic development")

Notwithstanding the detailed phrasing and multiple refinements in the Boolean string, several research articles that cover topics outside the intended subject of social development were returned. For instance, the title "Mega research infrastructure as a driver for high-quality development and innovation: Promoting scientific cooperation and interdisciplinarity" was returned in most of the digital libraries. An in-depth analysis of the article revealed that the scope of the research was within the context of a mega science infrastructure, the Shanghai Synchrotron Radiation Facility, but the specific focus is on interdisciplinary collaboration and networks to enhance scientific development. Only articles relevant to social development were extracted.

Academic digital libraries such as ScienceDirect, EBSCO, ProQuest, Research Gate, and Google Scholar were searched.

Analysis of Literature

The carefully crafted Boolean phrases that were employed to search for the literature relevant to the purpose of this research returned a rich collection of academic work in this area. It is believed that all published academic work related to the socioeconomic activities and social impact, specifically in the area of Carnarvon, was uncovered. A total of twenty (20)

relevant academic works were uncovered and analysed. For a clearer analysis and systematic flow of the presentation, the literature was divided and grouped into five broad but interconnected themes of subject matter within the area of Big Science and social impact research.

Theme 1: Relational Dynamics in Big Science Management: The nature and framing of the relationships between various stakeholders involved in Big Science initiatives significantly influence how the project interacts with the community and how social impact develops. The works of Binneman and Davis (2021), Tiplady (2024), and Velho et al. (2024) examine the dynamics and complexities inherent in the nature of relationships among stakeholders. Velho et al. (2024) frame the discussion from the point of view of the geographical, social, historical, and political complexities. The study found that there are unique challenges within this interrelation dynamic, such as engaging with indigenous or marginalised communities, which are critical for securing social acceptance. Tiplady's (2024) approach to the issue of relationships among stakeholders involved in a Big Science initiative starts to formalise the concept of social acceptance hinted at by Velho et al. (2024). Tiplady introduces the concept of a Social License to Operate (SLO) as a stamp of approval by local communities, stakeholders, and society for large-scale scientific projects to operate. The SLO should be negotiated through engagements and building relationships of trust with the stakeholders. Failure to secure an SLO can result in operational difficulties for the project, lead to delays, protests, or project cancellations due to community opposition or mistrust.

The literature of Velho et al. (2024) and Tiplady (2024) begins to talk directly to the issue of how social value can be achieved on the back of a big Science initiative. Prioritising the building of solid relationships among stakeholders is not just ethical but a strategic necessity that will assist the Big Science initiative to maximise its societal and scientific impact.

Binneman and Davies (2021) is also relevant to the discussion around stakeholder relationships. It uses the transition of the SKA from stakeholder management to a stakeholder engagement approach as an example of how the social license to operate can be negotiated. Binneman and Davies (2021) observed that, in its early days of operations, the SKA adopted a traditional stakeholder management approach that focused on controlling communication and mitigating risks to project goals. This top-down strategy prioritised scientific and technical objectives over local concerns. Local stakeholders, including farmers, residents of towns like Carnarvon, and municipal authorities, were initially viewed as potential obstacles due to their concerns about land use restrictions, economic impacts, and limited direct benefits from the project. This has led to tensions between the local communities and the project, aggravated by the SKA's land acquisition programme and regulatory restrictions, which were perceived to have been imposed on the community without proper consultation. Efforts to resolve the tensions were usually less successful as they were based on the top-down stakeholder engagement approach. The situation was dramatically turned around with a shift from the stakeholder management philosophy to stakeholder engagement, characterised by building relationships of trust with the community. Several strategies to foster engagement were introduced, and the result was a successful SKA socioeconomic development programme.

The three literatures are in agreement that stakeholder relations are essential in ensuring that a Big Science initiative achieves both its scientific and social impact. However, Binneman and Davies (2021) may have taken it a bit overboard by suggesting that the SKA socioeconomic development programme became successful after the shift from stakeholder management to engagement. It is accepted without doubt, as supported by Velho et al. (2024) and Tiplady (2024), that stakeholder relations are essential for the successful operations of a Big Science project in terms of achieving its dual mandate of delivering scientific excellence while delivering social impact in the community. This mandate is dictated through the receipt of

public funds, which must be used to develop the community. The claim by Binneman and Davies (2021) that the programme was successful has no basis, and no evidence was provided in that respect. The question of defining what a successful socioeconomic development programme is still stands, and it remains one of the objectives of this thesis. In addition, the concept of measuring impact will still be discussed as one of the themes coming out of this literature review.

The concept of building relationships among stakeholders in a Big Science initiative is central to the process of building social value within a community, and supports one of the objectives of this thesis, which is to determine how social value can be entrenched and sustained within a community.

Summary of the Reviewed Literature

The four scholarly readings discussed under the relational dynamics theme are each summarised below. The summary provides the main research objective of the research paper, the key findings, and captures the relevance of the source to this thesis:

Scholarly Source 1.1: This section reviews the article by Binneman and Davis (2021), which is titled "Management to Engagement: How South Africa's Square Kilometre Array Project Transformed Its Interactions With Stakeholder Groups".

Research focus*:* To analyse the evolution of stakeholder relational dynamics, examining how the SKA project in South Africa transitioned from a management-focused approach to a more collaborative engagement model with various stakeholder groups, including local communities, indigenous groups, and governmental bodies**.**

Key Findings*:* The SKA transitioned from a stakeholder management approach in its process of securing the land where the telescope is built and getting approval for the implementation of the project, to a stakeholder engagement model, which played a significant

role in facilitating long-term community acceptance of the project. Despite challenges like historiography, language barriers, and differing expectations, the engagement approach enhanced the project's legitimacy and ensured the success of its socioeconomic development programme.

Relevance to this Study*:* This source presents the concept of stakeholder engagement as one of the key areas that may be explored in the process of constructing social value by a Big Science initiative.

Scholarly Source 1.2: An analysis of Tiplady's (2024) publication titled "Social License to Operate—A Critical Success Factor in Realising Impact from Research Infrastructure" is conducted. This article was published as part of the Economics of Big Science 2.0: Essays by Leading Scientists and Policymakers, published by Cham: Springer Nature Switzerland, and it appears on pages 93 to 100.

Research Focus: The paper discusses the role of the concept of Social License to Operate in the context of Big Science initiatives like the SKA, showing its role in public acceptance of the project.

Key Findings: The study suggests that an SLO is a critical factor in ensuring that a Big Science initiative is able to deliver its scientific and societal benefits while maintaining community trust. It further shows the importance of procedural fairness, high-quality stakeholder engagement, and mitigating negative impacts on local infrastructure.

Relevance to this Study: The study supports the objectives by demonstrating that community acceptance of a Big Science initiative is essential for the success of the project in delivering social value.

Scholarly Source 1.3: This section analyses the work of Velho et al. (2024), titled "What is the Space for 'Place' in Social Studies of Astronomy?" published in Minerva. The article appears on pages 1 to 19.

Research Focus: The study employs the concept of "place" (geographical, cultural, and social contexts) to examine the interplay between Big Science projects and their local environments, including their cultural heritage, indigenous knowledge, and community identities and assess how these factors influence equitable access to the benefits of astronomy projects, such as education, employment, and cultural recognition, in host communities.

Key Findings: The study illustrates that engagement with the local indigenous people and understanding their cultural, historical, and geographical contexts in projects like the SKA can enhance project legitimacy and community inclusion.

Relevance to this Study: This scholarly work draws the attention of this thesis to the important aspect of considering the 'place' of the indigenous local community in the process of formulating and creating social value.

***Theme 2: Competing Priorities*:** The genesis of this thesis lies in the very issue captured in this theme, dealing with what was framed in the introductory section of this thesis as the dichotomy of developmental objectives between the implementers of Big Science initiatives and their local populace. This dichotomy stems from the divergent priorities, which are a function of what Butler (2018) called the habitus. The works of Basheer (2023), Butler (2018), Chinigò (2018) and Gastrow and Oppelt (2019), and will be useful in unpacking the issues related to tensions between global scientific ambitions and local development needs. Although there are key material differences in the methodological approaches employed by these five academic works in exploring the interplay between global scientific ambitions and local community development expectations, they are unanimous that in the battle of priorities between the two competing interests, the local development mandate suffers, more especially in the historically marginalised region of the Karoo.

Gastrow and Oppelt (2019) use qualitative approaches involving SKA stakeholders and local communities to explore development mandates, emphasising institutional perspectives. Chinigò (2018) adopts a critical theoretical approach, analysing the SKA through secondary data and policy documents to reflect on astronomy's developmental trade-offs, emphasizing broader socio-political and historical contexts, while Butler (2018) and Basheer's (2023) adopts an almost similar approach as they both compare the views and perceptions of the local community members with those of the SKA personnel about the SKA project's scientific and developmental goals, focusing on knowledge relativity and lived experiences. The works of Buter and Basheer complement each other as they both focus on providing a community-specific perspective; they reinforce the theme of local marginalisation highlighted in the other works. They also align with Gastrow and Oppelt's (2019) emphasis on development disputes due to competing priorities and Chinigo's critique of prioritising global science over local needs.

In terms of how the literature under this theme seeks to address the challenge of competing priorities, they are also in unison in suggesting inclusive stakeholder engagement, context-sensitive development, and transparent, equitable governance to reconcile the SKA's global scientific ambitions with local development needs. This approach seeks to bridge the gap between the top-down scientific goals and bottom-up community aspirations, ensuring that the SKA delivers meaningful, equitable benefits to the Karoo while advancing global astronomy.

Yet again, just as in the literature reviewed under the previous theme, the concept of stakeholder engagement features highly as a possible solution towards the delivery of relevant social value to the community. It also ties in with Tiplady's (2004) concept of a Social License to Operate. The principles proposed in this literature are the same principles that could facilitate the development of the SLO.

This literature reinforces the purposes of this thesis, which is to attempt to close the gap

between the divergent developmental views in favour of the local communities and start to put forward useful suggestions as to what the solution to the problem that this thesis seeks to address could look like.

Summary of the Reviewed Literature

Below is a summary of the reviewed articles under the theme "Competing Priorities". The section provides a summary of the research objectives and key findings of each of the three works, and also shows how each contributes to the research objectives of this thesis:

Scholarly Source 2.1: In this section, the work of Basheer (2023), titled "Local development needs and aspirations and the international Square Kilometre Array radio telescope: Views from Amandelboom", will be analysed. This thesis was conducted as part of the fulfilment of the requirements for a Masters degree at Stellenbosch University.

Research Focus: To explore how the global SKA project aligns or conflicts with the local development needs and aspirations of the local community of Amandelboom, Williston, a small town in South Africa's Northern Cape, affected by the SKA project, particularly in terms of socio-economic development and community engagement.

Key Findings: The study finds that there is a disconnect between the SKA's global scientific ambitions and the immediate socio-economic needs of Amandelboom residents, such as access to basic services, employment, and education, as such, the community has lost trust in the SKA, given that there is a lack of progress and direct impact in addressing their poverty and inequality conditions. It highlights the importance of community voices in shaping development agendas, noting that local aspirations often prioritise practical improvements over the abstract benefits of scientific advancement.

Relevance to this Study: This work supports the problem statement of this thesis, buttressing the concept of the dichotomy of developmental objectives that was framed as one

of the problems that this thesis is attempting to solve, highlighting the urgency of this problem and offering insights on how it can be addressed.

Scholarly Source 2.2: Walker et al.'s (2019) article titled "Karoo futures: Astronomy in place and space–Introduction" appears in Volume 45, Issue 4 of the Journal of Southern African Studies, from page 627 to 639.

Research Focus: To examine the interplay between global scientific ambitions and local socioeconomic realities in the context of the SKA, focusing on themes of place, space, and identity and propose an interdisciplinary research agenda that brings together social sciences and astronomy, addressing issues like land use, indigenous knowledge, and the socio-political implications of the SKA.

Key Findings: The SKA came with a significant land use change in the Karoo, creating a large astronomy reserve that disrupts traditional land-based economies, particularly sheep farming, and raises questions about identity and belonging in a region marked by a racialised apartheid legacy. It highlighted the SKA's role as a "knowledge frontier," where competing visions of science, development, and local agency are negotiated, often revealing power imbalances between global stakeholders and marginalised communities.

Relevance to this Study: This study supports the problem statement of this thesis, emphasising the significance of context in negotiating common priorities during the implementation of Big Science projects, such as the SKA.

Scholarly Source 2.3: The article titled "The Square Kilometre Array and local development mandates in the Karoo" (Gastrow & Oppelt, 2019) appears in Volume 45, Issue 4 of the Journal of Southern African Studies, on pages 711-728.

Research Focus: The paper critically analyses the SKA's local development mandates in the Karoo, focusing on how they align or diverge from the project's global and national

objectives. It further examines the local community's perceptions of the SKA in light of the development promises made at the inception of the project and the extent to which these are realised, together with the overall human development trajectory of Big Science projects, especially in a marginalised region characterised by poverty, inequality, and unemployment.

Key Findings: The SKA's local development mandate is different from its global scientific goals of advancing universal scientific knowledge. Local communities are contesting this approach to development, prioritising immediate socio-economic benefits. There has been evidence of civic resistance, including the 2016 shutdown of an open community forum due to opposition, highlighting tensions between the SKA and local stakeholders. The authors suggest that the SKA's contribution to human development in the Karoo is limited by its failure to fully address the region's socio-economic challenges, calling for more inclusive and participatory development strategies.

Relevance to this Study: Gastrow and Opelt's (2019) work is relevant in that it reinforces the discussion on the dichotomy of developmental mandates between the SKA project and the Community, opening a gap for further research in this area.

Scholarly Source 2.4: The Thesis of Butler (2018), titled "Knowledge relativity: Carnarvon residents' and SKA personnel's conceptions of the SKA's scientific and development endeavours", published by Stellenbosch University, is analysed in the next section.

Research Focus: The focus of the study is to examine the differing perceptions of the SKA's scientific and developmental goals between Carnarvon residents and SKA personnel, using Pierre Bourdieu's concept of habitus to explore underlying social contexts and power relations. It also seeks to understand how the SKA's development discourse, which frames science as a driver of societal benefits, is received by a community facing poverty, low

education levels, and historical marginalisation. It further analyses the socio-political dynamics shaping local responses to the SKA, including resistance and scepticism about its promised benefits.

Key Findings: The study found that Carnarvon residents and SKA personnel hold conflicting conceptions of the SKA's purpose and impact, rooted in their differing social contexts. It demonstrates how the SKA's scientific ambitions are entangled with local socio-political contestations, revealing a disconnect between global science and local realities.

Relevance to this Study: This study also reinforces the discussion on the misalignment of developmental mandates between Big Science projects and local communities.

Scholarly Source 2.5: The article titled "Critical reflections on astronomy and development. The case of the Square Kilometre Array (SKA) radio telescope project in South Africa" (Chinigò, 2018), published as part of the XXXth IAU General Assembly proceedings held in August 2018 in Vienna, Austria. The next section analyses this conference proceedings paper.

Research Focus: To critically reflect on the relationship between astronomy and development in the context of the SKA, focusing on its implications for South Africa's socio-economic landscape and to explore how the SKA shapes visions of African futures, particularly in terms of knowledge production, global scientific leadership, and local development.

Key Findings: The paper finds that the SKA is framed as a global scientific endeavour that positions South Africa as a leader in astronomy, but this vision often overshadows local development needs in the Karoo. The tension between the competing narratives about science, progress, and development reinforces power imbalances between global stakeholders and local

communities. The need for a more inclusive approach to development, where local communities are active participants in framing the nature of scientific progress, is proposed.

Relevance to the Study: This study also reinforces the discussion around competing priorities of development, further highlighting the problem of a dichotomy in developmental objectives.

Theme 3: Measuring Impact: This theme addresses the complexity of defining and measuring social impact. Several studies have already confirmed that the SKA project has made significant strides in transitioning into a community-focused social development vehicle, achieving several milestones in this regard; however, there remains a lack of tangible evidence of its impact on society. The issue lies in the ambiguity surrounding the definition of social impact and the methods for measuring it. The academic works by Catalano (2024), Crosby (2012), Florio and Sirtori (2016), and Ha-Duong (2015) collectively tackle the challenge of measuring social impact in the context of Big Science research. First and foremost, these academic contributions agree that the impact of large-scale research infrastructures should extend beyond the knowledge enterprise. They clarify the question of mandate in Big Science initiatives, confirming that their mandate goes beyond scientific development. Crosby (2012) considers stakeholders such as funding agencies and local economies in the SKA context, emphasizing indicators that predict benefits for these groups; Catalano (2024) advocates for inclusive impact assessments, ensuring that the evaluation of impact accounts for all stakeholders, including diverse societal groups; Ha-Duong (2015) identifies stakeholder engagement as a critical factor for social acceptability, integrating community and public perspectives into impact measurement; and Florio and Sirtori (2016) explicitly categorize benefits by stakeholder groups, such as firms in procurement chains and public media users. While the focus of this thesis lies specifically in social impact, these works emphasise the significance of impact across multiple stakeholders.

Although each of the scholars advances practical proposals on how impact can be measured, they still fall short in terms of standardising metrics for intangible benefits and managing cultural or contextual differences. Florio and Sirtori (2016) use the social cost-benefit analysis (CBA) framework to quantify the welfare effects of large-scale research infrastructure, applying contingent valuation to estimate non-use values, such as the public's appreciation of scientific advancements and willingness to pay for scientific discoveries. Phillip focuses on predictive indicators for the SKA. The approach used implicitly aligns with CBA by assessing success factors that contribute to societal benefits, such as economic and scientific outcomes, and Catalano (2024) explores ways to define and measure the impacts of large-scale Research Infrastructures, including non-market benefits, and stresses the need for standardised methodologies to capture diverse impacts. And finally, Ha-Duong's (2015) focus is on the Vietnamese context, applying a related framework to assess the social acceptability of infrastructure projects, incorporating stakeholder perspectives into a broader cost-benefit evaluation.

Notwithstanding the rich insights offered in these academic works on the approaches to defining and measuring impact, and specifically the social impact of Big Science initiatives, there is still a gap in providing a unifying solution to dealing with social impact. Ha-Duong's (2015) focus on social acceptability in Vietnam highlights local nuances that may not directly translate to Florio and Sirtori's (2016) European Research Infrastructure context. Additionally, the reliance on CBA that is extensively outlined in Florio and Sirtori (2016) and implied in Crosby (2012) and Catalano (2024) risks oversimplifying complex social impacts if non-quantifiable factors are undervalued. This research gap provides an opportunity for this thesis to intervene in proposing a crosscutting definition of impact, in the form of social value, and making proposals on how Big Science initiatives can deliver and measure the social value.

Summary of the Reviewed Literature

Below is a summary of the reviewed articles under the theme "Measuring Impact":

Scholarly Source 3.1: Florio and Sirtori's (2016) article titled "Social benefits and costs of large-scale research infrastructures" was published in Volume 112 of the Technological Forecasting and Social Change Journal, covering pages 65-78.

Research Focus: This study aims to develop a cost-benefit analysis (CBA) framework for evaluating the socio-economic impacts of large-scale research infrastructures (RIs) by identifying and quantifying their social benefits and costs, proposing a conceptual model that categorises benefits into six types: knowledge outputs, technological spillovers, human capital formation, cultural effects, services to third parties, and the intrinsic value of discovery.

Key Findings: The study demonstrated that CBA can be used to assess benefits for scientists, students, firms, and the public, showing that such projects can yield significant societal returns despite high costs, thus providing a structured tool for policymakers to justify investments in RIs.

Relevance to the Study: The relevance of this paper is to show the significance of measuring the impact of Big Science projects**,** especially the need to incorporate all impact areas, including social impact. The methodology applied in the CBA shows a significant gap in accurately measuring social aspects of development, thereby providing an opportunity for further research in this area.

Scholarly Source 3.2: The Doctoral dissertation "Predictive indicators of success in science & engineering projects-application to the SKA initiative" (Crosby, 2012), published by Curtin University, is analysed in the next section.

Research Focus: This study seeks to identify predictive indicators of success for large-scale science and engineering projects, with a specific application to the SKA, to guide project management and enhance outcomes.

Key Findings: The study proposes key indicators such as stakeholder engagement, clear governance structures, risk management, and alignment of scientific and socio-economic goals, suggesting that the success of a Big Science initiative depends strongly on effective community engagement in host regions like South Africa's Karoo, and proactive mitigation of socio-economic risks, such as land use conflicts, to ensure both scientific advancement and local development benefits.

Relevance to the Study: This study also reinforces the need to develop a comprehensive approach to measuring impact and highlights the gap that still exists in this area.

Scholarly Source 3.3: The Book Chapter "Thinking How to Define and Measure Impacts of Ris", authored by Gelsomina Catalano, appears as Chapter 9 of the book "The Economics of Big Science 2.0: Essays by Leading Scientists and Policymakers published by Springer as part of the Science Policy Reports series.

Research Focus: This study aims to address the challenges of defining and measuring the socio-economic impacts of Big Science projects by proposing a roadmap for conceptualising and quantifying their effects beyond scientific outputs. It also deals with the difficulties in measuring intangible benefits like social impact.

Key Findings: The study emphasises the need for tailored impact assessment frameworks that account for context, suggesting methodologies like cost-benefit analysis and stakeholder surveys to capture impacts on employment, innovation, and societal value.

Relevance to the Study: This study also contributes to this thesis's objective of dealing with the description and measurement of social impact.

Scholarly Source 3.4: The article "Social acceptability of large infrastructure projects in Vietnam" (Ha-Duong et al., 2016) appears in the 14th Special Issue of the Journal of Field Actions.

Research Focus: This study investigates the social acceptability of large infrastructure projects in Vietnam, focusing on factors influencing public and stakeholder support, such as community engagement, environmental impacts, and economic benefits

Key Findings: Ha-Duong et al. (2016) finds that social acceptability is enhanced by transparent communication, equitable benefit distribution, and mitigation of negative impacts like displacement or environmental degradation. The study underscores the importance of participatory processes and addressing local concerns to reduce resistance and foster project success, offering lessons for managing large-scale projects in developing contexts where community trust is critical

Relevance to the Study: This study expands the context of Big Science social acceptability beyond the SKA to show the importance of context in grappling with the issue of social impact measurement, thereby reinforcing the objectives of this thesis around the area of defining and measuring impact.

Theme 4: Policy as a Driver of Impact: One of the lateral discussion points touched on in some of the literature relates to two strands of policy effect within the Big Science domain. One strand deals with policy regarding the setting up and funding of Big Science initiatives, and the other deals with policy that drives developmental objectives or Big Science initiatives. The academic works by Adams and Tiplady (2023), Chinigo and Walker (2020), Chitereka (2022), Gastrow and Oppelt (2018) and Oortwijn et al. (2024) offer insights into the role of

policy in influencing the development trajectory within Big Science initiatives. These scholarly articles all share a common concern for aligning Big Science funding and implementation policy with societal benefits. The research by Oortwijn et al. (2024) is focused on the health domain, and it offers valuable insights into how Big Science policy can be structured as a collaborative process involving scientists, policymakers, practitioners, and the community to maximise societal impact. The scope of Adams and Tiplady (2023), Chinigo and Walker (2020), Chitereka (2022), Gastrow and Oppelt (2018) and Oortwijn et al. (2024) is within the SKA project; they all emphasise that the SKA requires intentional policy frameworks to translate scientific advancements into societal benefits.

The establishment of Big Science initiatives is largely aligned with policy directions that seek to advance global scientific goals and satisfy global ambitions. For instance, the establishment of the SKA project in South Africa is aligned with South Africa's Science and Technology policy of leveraging the country's geographic advantage in areas like Astronomy to become a world leader in astronomy research (Department of Science and Technology, 2029). The scholarly work in this regard indicates that this is a divisive approach; policies must address local socio-economic challenges to avoid marginalisation. This approach aligns with the objective of this thesis, to contribute to policy development in the funding and implementation of Big Science initiatives.

Summary of the Reviewed Literature

Below is a summary of the reviewed articles under the theme "Policy as a Driver of Impact":

Scholarly Source 4.1: The peer-reviewed journal article titled "How to strengthen the societal impact of research and innovation? Lessons learned from an explanatory research-on-research study on participatory knowledge infrastructures funded by the Netherlands

Organization for Health Research and Development" (Oortwijn, et al. 2024) appears in Volume 22, Article number 81 of the open-access journal Health Research Policy and Systems.

Research Focus: This study seeks to explore how research and innovation can enhance societal impact. The main objective of the study is to understand how large-scale scientific infrastructures can contribute to societal needs through a more collaborative and participatory research approach, aiming to provide insights that could guide future policy and funding in health research.

Key Findings: The study proposes a policy structure that seeks to enhance the societal impact of research by fostering more inclusive, collaborative, and user centred research processes. However, challenges such as the need for institutional support, long-term commitment, and alignment with societal needs remain barriers to fully realising this impact.

Relevance to the Study: This study contributes to the discussion on how policy can help improve the social impact of delivery by large-scale scientific infrastructure

Scholarly Source 4.2: The peer-reviewed journal article titled "Science, astronomy, and sacrifice zones: development trade-offs, and the Square Kilometre Array (SKA) radio telescope project in South Africa" by Davide Chinigò and Cherryl Walker appears on pages 391 to 413 of Volume 46, Issue 3 of the journal Social Dynamics: A Journal of African Studies.

Research Focus: This article examines the intersection of science, development, and environmental sacrifice zones, using the SKA project in South Africa as a case study. The research aims to analyse the socio-economic and political trade-offs involved in large scientific projects like the SKA, focusing on their potential impact on local communities and the environment.

Key Findings: The findings reveal that the SKA project brings both positive and negative consequences for local communities in South Africa. While it promises potential economic and technological benefits, it also highlights the tensions between scientific advancement and the displacement of marginalised populations, with long-term socio-environmental consequences still unclear.

Relevance to the Study: This study contributes to research objective 3 of this thesis, which seeks to intervene in the policy space regarding the structural formation of the Big Science project and its developmental outlook in the local communities. The paper offers insights into policy possibilities that could bridge the gap between scientific advancement and the plight of marginalised populations.

Scholarly Source 4.3: The doctoral Dissertation by Jekonia Chitereka, titled “Big Science, Politics and Global Development: The Case of Square Kilometre Array (SKA) in Africa”, was published in 2022 on behalf of the University of Leeds.

Research Focus: The research explores the relationship between "Big Science" initiatives, politics, and global development, with a specific focus on the Square Kilometre Array (SKA) project in Africa. The objective is to understand how these large-scale scientific projects influence national and regional politics and contribute to global development agendas, particularly in African countries.

Key Findings: The research demonstrates that while Big Science projects like the SKA hold promise for driving development in Africa, their impact is often mediated by political agendas, and their benefits may not be equally distributed across the continent. The findings suggest that a more nuanced approach is needed to ensure that these projects contribute effectively to global development while addressing local needs.

Relevance to the Study: This study brings a broader view of the developmental potential of Big Science initiatives, beyond their immediate contact areas, and it directs conversations about policy that will drive development at a regional level. A concern worth considering in addressing objective 3 of this thesis.

Scholarly Source 4.4: The article "Big science and human development-what is the connection?" (Gastrow & Oppelt, 2018) appears in Volume 114, Issue 12 of the South African Journal of Science on pages 1–7.

Research Focus: This study investigates the connection between Big Science initiatives and human development, specifically looking at how large-scale scientific projects in South Africa contribute to the country's broader development goals. The objective is to understand how Big Science can influence policy for intervention in socio-economic challenges and fostering sustainable human development.

Key Findings: The study concludes that Big Science initiatives in South Africa have the potential to contribute to human development, particularly in the fields of education, technology, and skills development. However, the full benefits are only realised when these projects are integrated into broader socio-economic policies that promote inclusive development.

Relevance to the Study: This study supports objective 3 of this thesis by adding to the conversation on policy interventions for socio-economic development and fostering sustainable human development.

Scholarly Source 4.5: The book chapter titled "Big Science in South Africa: a catalyst for human capital development and mission-driven innovation" by Daniel Adams and Adrian Tiplady appears in the edited volume "Big Science in the 21st Century: Economic and societal

impacts" edited by Panagiotis Charitos, Theodore Arabatzis, Harry Cliff, Günther Dissertori, Juliette Forneris, and Jason Li-Ying, published by IOP Publishing in 2023.

Research Focus: This book chapter analyses the role of Big Science in South Africa, with a particular focus on how it drives human capital development and mission-oriented innovation. The objective is to evaluate how scientific infrastructure projects contribute to workforce development, technological innovation, and economic growth in South Africa.

Key Findings: The findings show that Big Science projects in South Africa have been instrumental in fostering innovation and human capital development. They provide critical infrastructure for research and technological progress but require ongoing investment in skills training, policy alignment, and international collaboration to fully capitalise on their potential for long-term economic and societal benefits.

Relevance to the Study: This chapter also contributes to the debate on how Big Science projects can contribute to social development within a favourable policy environment.

***Theme 5: Big Science Contributions to Social Development*:** This theme cuts across the four themes discussed earlier, bringing together issues of stakeholder considerations, alignment of developmental priorities, and policy considerations in harnessing the developmental potential of Big Science initiatives. The literature reviewed in this section has a heavy focus on the contributions of Big Science initiatives in development in general, with a specific focus on their impact on social development. The work of Adam (2020), Halder et al. (2025), and McBride et al. (2018) provides rich insights into this subject. The common thread across these scholarly works is the acknowledgement that large-scale research infrastructures can have profound social impacts, both positive and negative. All three studies emphasise the importance of integrating social considerations in the form of policy alignment, local community development, and risk management into the planning and implementation of these

projects. This approach in the three works cements the notion that Big Science facilities should be used as instruments of development, bringing together all the necessary enabling instruments to ensure positive social impact.

The collective contributions of these works to the discussion around the impact-oriented nature of Big Science initiatives are enriched by the different angles from which the works approach the subject. Adam (2020) approaches the subject from a political economy and governance perspective, emphasising the role of policy and politics in the success or failure of large infrastructure projects. Adam's angle sheds light on the role of the political and institutional context and how it can either enable or hinder the realisation of social benefits. While McBride et al. (2018), on the other hand, concentrate more on the potential of astronomy as a tool for socioeconomic development. Their focus is on the tangible and intangible benefits of research infrastructures, such as the development of human capital, technological innovation, and the stimulation of local economies, framing these projects as drivers of long-term societal transformation, and Halder et al. (2024) takes on a more sharper angle, approaching the subject from an empirical and methodological approach, investigating social risks through a comparative analysis of relational versus traditional approaches to risk assessment. This perspective is more concerned with risk management and the mitigation of negative social impacts, focusing on the evaluative frameworks that can be used to ensure that large-scale infrastructures do not adversely affect local communities or environments.

Together, these works provide a comprehensive and multi-dimensional exploration of the social impact of large-scale research infrastructures. By combining these perspectives, the debate is enriched with a more holistic view that takes into account not only the opportunities and benefits but also the challenges and risks associated with large-scale research infrastructures. Together, they call for a balanced approach, one that prioritises long-term

societal benefits while addressing the immediate and potential negative consequences that can arise from these large and often disruptive projects.

Summary of the Reviewed Literature

The section below provides a summary of the research objectives and key findings of each of the three works, and also shows how each contributes to the research objectives of this thesis:

Scholarly Source 5.1: The journal article "Technology, policy and politics: critical success factors in high-technology infrastructure projects" (Adam, 2020) was published in Volume 46, Issue 3 of the journal Social Dynamics.

Research Focus: This study aims to identify the critical success factors for high-technology infrastructure projects, focusing on the intersections of technology, policy, and politics. Specifically, it seeks to explore how these factors can impact the success or failure of large infrastructure projects and what role governance, institutional alignment, and political considerations play in achieving desirable social outcomes.

Key Findings: The research concludes that the success of high-technology infrastructure projects depends largely on strong governance frameworks, effective policy alignment, and political stability. The study highlights that a lack of coordination between technology, policy, and politics often leads to inefficiencies, delays, and missed opportunities for broader societal impact. Successful projects require a comprehensive understanding of political dynamics, the involvement of stakeholders, and the creation of flexible policy frameworks that adapt to changing technological and social contexts.

Relevance to the Study: This paper is aligned with the discussions around the objectives of this thesis, specifically the discussions on policy alignment to ensure effective delivery of social impact by Big Science projects.

Scholarly Source 5.2: The journal article titled “The potential of astronomy for socioeconomic development in Africa”, written by Dr Vanessa Mc Bright and her colleagues, was published in 2018 in Volume 2, Issue 7 of the journal Nature Astronomy, and it appears on pages 511-514.

Research Focus: This paper explores the potential of astronomy and large-scale astronomy projects, such as the SKA, in driving socioeconomic development in Africa. The authors investigate how these scientific infrastructures can generate benefits in terms of technology transfer, education, job creation, and economic development, with a focus on enhancing local capacities and fostering long-term growth.

Key Findings: The study finds that large-scale astronomy projects have the potential to be significant drivers of socioeconomic development in Africa. They can contribute to building scientific infrastructure, advancing education, and stimulating local economies by creating jobs and fostering technological innovation. The authors argue that these projects should be viewed not only as scientific undertakings but as opportunities for broader development, particularly in regions with limited access to high-tech industries. The success of these projects, however, depends on ensuring that the benefits are shared equitably with local communities and aligned with national development priorities.

Relevance to the Study: This paper reinforces the assertion that Big Science projects should be seen as instruments for social development, not only due to their source of funding being the public fiscus, but because they possess greater potential.

Scholarly Source 5.3: The peer-reviewed journal article titled “Evaluation of social risks in large-scale infrastructure projects in India – a comparative study using relational and traditional approaches”, authored by Aritra Halder, Atul Bhardwaj, and Gobinda Barik, was published on 19 August 2024 in the International Journal of Construction Management.

Research Focus: This paper examines the social risks associated with large-scale infrastructure projects in India, comparing relational and traditional approaches to assessing these risks. The goal is to evaluate how these methodologies can be used to understand and mitigate the negative social impacts of such projects, including displacement, environmental degradation, and inequality.

Key Findings: The research concludes that relational approaches to risk assessment are more effective in identifying and addressing the complex social risks of large-scale infrastructure projects compared to traditional methods. Relational approaches, which emphasise stakeholder relationships and context-specific dynamics, allow for a deeper understanding of the social fabric and the potential consequences of these projects on local communities. The study advocates for integrating these relational approaches into project planning and risk management to ensure that large-scale infrastructures are socially sustainable and that their benefits outweigh the potential harms.

Relevance to the Study: Although this paper focuses on the area of risk mitigation, which has not been explicitly considered in the framework of this thesis, it offers useful insights into the overall idea of adopting innovative ways of planning for the implementation of Big Science projects to include impact delivery to avoid the risks associated with the non-inclusion of local priorities in the planning.

Final Thoughts on the Literature Review

It should be emphasised that while policy alignment is proposed as a measure to address the social impact of Big Science, it is recognised that a policy shift alone may not be the only solution. Overemphasising the potential of policy to resolve complex socio-economic challenges, without fully addressing systemic barriers such as funding constraints or global power dynamics, would be a mistake. For instance, Chinigò and Walker's (2020) focus on sacrifice zones highlights how global scientific priorities can overshadow local needs—a

challenge that policy alone may not fully resolve without broader structural changes. Similarly, the optimism expressed by Adams and Tiplady (2023) regarding innovation ecosystems may downplay the long-term investment and political will required to sustain such initiatives in resource-constrained settings. In this regard, this thesis adopts a multi-layered approach to address the impact generated by Big Science initiatives. The reviewed literature collectively provides various perspectives and approaches to tackling social impact. The first set of literature responds to the issue of stakeholder interactions, highlighting deficiencies in the relationships among the various stakeholders involved in a Big Science project. They propose a stakeholder engagement approach that effectively navigates the complex contextual dynamics to create a balanced and equitable framework, ensuring the Big Science initiative achieves both its scientific and social mandates.

The second set of literature responds to the question of how to align the priorities of doing science with those of the local communities. We learn that priorities are shaped by the external environment, the priorities of Big Science being the advancement of the scientific endeavour, sometimes shaped by policy drivers that demand excellence and global leadership in science, while the priorities of the populace affected by Big Science, in this case the SKA project, would be shaped by the conditions of deprivation and historical injustices. The role of Big Science should be to facilitate the convergence of these priorities in a process of building a social licence to operate that is necessary for the achievement of its goals.

In addition to nurturing healthy stakeholder relations, mitigating divergent priorities, and setting the appropriate policy scene as a process of cultivating a fertile ground for impact delivery by Big Science initiatives, the literature pointed to the need to develop standardised methodologies to define and measure social impacts. It was established that it would be critical to account for non-economic social benefits in the process of measuring impact.

The literature has shown that there are research gaps in each of the areas identified; as such, further scholarly work is required to enhance the work of Big Science initiatives in the identified areas of stakeholder relationships, reconciling divergent priorities, measuring impact, and influencing policy that will level the playing field for in the process of developing social value for communities lying in the periphery of a Big Science initiative.

Conceptual Framework

This section aims to systematically review the relevant literature in the field of humanism and social entrepreneurship. Further literature will be reviewed to synthesise a workable philosophical perspective on the concept of humanistic management and subsequently develop a similar approach to social entrepreneurship. It is proposed that humanism, when applied within the social entrepreneurship environment, can effectively drive social value and impact in society. To achieve this, this section will begin with a historical overview of the concept of humanism, tracing its theoretical development from the 19th century to the present, and proceed to construct the meaning and conceptual identity of the three pillars of humanistic management within the framework of a Big Science project. The three pillars have been conceptually identified by Fu et al. (2020) as human dignity, ethical consideration in managerial decision-making, and active engagement with stakeholders.

The key salient constructs within this area of knowledge include human dignity, social value, human virtue, and integrity (Dierksmeier, 2016; Dyck, 2020; Fu et al., 2020; Koon, 2021), which are, from an organisational paradigm, tenets of social entrepreneurship (Lobo et al., 2022; Pirson, 2012; Srivastava, 2020). This confluence shows the close link between humanism and social entrepreneurship, showing that if the two are skilfully combined within an organisational management environment, progressive outcomes can be achieved. This section will further explore the application of humanistic management principles within a

social entrepreneurship setup in the setting up, management, and implementation of Big Science initiatives. The literature review will seek to delineate measurable variables that can be used to measure the outcomes and impact of the application of humanistic management approaches within the social entrepreneurship environment.

To achieve these objectives, this literature review will be divided into three broad sections - the first section deals with the conceptual identity of humanistic management within the realm of a Big Science initiative while unpacking its relevant conceptual structures such as human dignity, human virtue, ethics, and integrity; the second section will unpack the concept of social entrepreneurship to build a case for its link with humanistic management principles. The last section will bring the two elements together to build a conceptual model that is applicable within the realms of the Big Science initiative, to show how social value can be derived and measured.

Humanistic Management – A Historical Perspective

To follow the historical development of the concept of humanism, it is most appropriate to first establish some level of conceptual clarity. However, attempting to come up with a straightforward definition of humanism would invariably be an extremely tall order, as it would require following its evolution along the lines of history, tradition, philosophy, and religion, as the concept is continuously evolving, whilst at the same time it carries different meanings and connotations for different groupings. This thesis will not attempt to come up with a definition of humanism but will instead endeavour to develop a workable concept of what humanism looks like within a Big Science management paradigm.

In the classical humanist tradition, for instance, humanism is seen as a way to break from the clutches of authority, be it from spiritual or faith-based, or political leadership (Nida-Rümelin, 2009). Humanism allows people to express their autonomy and self-expression through reason rather than oppression and fear. Odumegwu et al. (2022) hint at a deeper

philosophical view of humanism, which is centred on an anthropocentric view that puts the individual at the centre of existence. Anthropocentrism, as a Western religious construct, holds the view that the world is purely natural and divine; the human occupies a special place in the centre of this divinity by virtue of his or her likeness to God. The human being becomes the centre of the universe, with everything else existing for his and her existence and comfort.

Other variants of the concept, while putting individual and moral autonomy at the centre of focus, include notions of intellectualism, inclusivity, and individualism (Nida-Rümelin, 2009, p. 17), tying in with the notion of humanism as a way of breaking from the clutches of authority as a free-thinking individual. However, individualism in this case should not be seen as isolationism but rather a form of intellectual autonomy.

A common theme within these divergent variants of humanism is that of liberty, which insists on people formulating their understanding of what it means to be human rather than being coerced through rules, authority, or doctrines. These human liberties form the basis and core principles of the contemporary humanistic management paradigm.

The concept of humanism is as old as humankind. Scholars such as Davies (2008), Koon (2021), and Nida-Rümelin (2009) trace humanism as a philosophical human relational concept from the late Middle Ages through to the early Renaissance. The formalisation of the concept into mainstream discourse started to develop around the mid-twentieth century (Cherry, 2009). Knights (2021) observed that the concept of humanism emerged as a way to neutralise the authoritarian leadership that prevailed in medieval times, where leaders demanded obedience and forced respect. Leadership at that time was based on clericalism, where the source of knowledge was believed to be divine and could not be challenged. Enlightenment emerged as a form of opposition to this leadership approach. This awakening started to mould into philosophies of enlightened humanism, taking shape in the 18th century, with growing tendencies to demand and insist on self-discipline and rational thinking beginning to replace

the elitist authoritarianism of the past (Knights, 2021). The growth of interest in Greek and Roman literature, catalysed by Greek literature becoming widely available in the West and the technological developments ushering in the printing press, ignited more interest in reading. These developments led to greater enlightenment for individuals to the fact that intellectualism was not reserved for the few philosophers and clergy but a virtue available to all. With this enlightenment, individual human persons started to free themselves from the bondage of medieval thinking, affirming their humanity through rational thinking and making choices for themselves, realising the full potential of individualism as a determinant of personal good and the good of the society (Odumegwu et al., 2022). This was the birth of Renaissance Humanism, which was characterised by a growing interest in what it means to be human (Cartwright, 2020). These developments during the Renaissance and the growing hunger for knowledge and learning led to the developed world we enjoy today (Odumegwu et al., 2022). Humanity was able to shift from the reliance on religion, myth, and beliefs, beginning to use science, technology, and art for the development of humanity (Cartwright, 2020; Odumegwu et al., 2022).

To some extent, Renaissance Humanism became a form of critical theory, slowly gaining momentum through the 1920s, whereby individuals were starting to take a critical stance against the demeaning culture of the commanding and top-down economic and leadership system (Kozlarek, 2021), although scholars at that time believed that, even though the movement was centred on the importance of humanity, it was still perceived to be devoid of human subjectivity and agency in its analysis. Critical theory later developed and transformed into critical humanism that integrates factors such as recognition, emancipation, solidarity, and self-realisation, highlighting the importance of individual and collective agency in creating transformative social change while maintaining a critical stance towards oppressive structures (Kozlarek, 2021).

At the time when humanism was at its state of development, there was a parallel and counter philosophy that gained momentum around the beginning of the nineteenth century, dismissing humanism as mere atheist rhetoric (Odumegwu et al., 2022). The current version of these sentiments is evident in the view of humanism as a phenomenon that is attempting to replace scientific reasoning and brush away the interconnectedness of natural systems (Laszlo, 2019). Odumegwu et al. (2022) draw our attention to a competing philosophical outlook that emphasises the interconnectedness of all aspects of existence, whether animate or inanimate, whether physical or spiritual. This view stresses the approach that humanism is not the answer to all humanity's problems, contrary to what humanism scholars seem to suggest. Proponents of this belief system perceive humanism as a phenomenon that has completely negated metaphysics and spirituality, pinning all hope of human flourishing and well-being on altruism and the power of human autonomy. Wahyudi and Bakri (2021) present a similar view, arguing that anthropocentrism has completely removed divinity from existence and people's well-being, it has prioritised the values of human beings as the centre of focus. A phenomenon that Laszlo (2019) refers to as species exceptionalism, which anthropomorphises the ideals of human interactions, thereby giving rise to an approach that sees the human being as superior within the system of existence. The anthropocentric worldview tends to prioritise human welfare over anything else, considering everything else as a means to human existence (Kopnina, 2020).

Ahn (2023) observed that this anthropocentric view of humanism, which positioned the human as the domineering centre of all, led to the atrocities of World War II due to its Eurocentric and imperialist agency of the human; this era marked the beginning of the decline in Renaissance humanism. These sentiments led to a widespread disdain towards humanism and began to usher in modernised views of the philosophy. The decline in Renaissance and enlightened humanism could be seen as the impetus that led to the development and rise of the

post-humanism movement (Ahn, 2023). Although other intervening factors, such as cybernetics and the growth in technology, played a bigger role in considering non-human entities and factors as integral to the wellbeing of humanity, the decline of renaissance humanism led to the increased consideration of human existence, whereby the human is an equal partner in the broader scheme of what it means to be human (Wolfe, 1995).

At the periphery, anthropocentrism seemed to be aligned with humanism, given that humanism also seeks to promote human welfare above other objectives, more especially in terms of economic considerations. However, humanism is also concerned with social and environmental justice; therefore, issues of ethics, morality, and justice would feature highly in humanistic philosophy. What sets anthropocentric and humanistic approaches apart is that the former tends to neglect the important features of humanism as it seeks to elevate human welfare above everything else. Ethics, morality, and fairness would come second from an anthropocentric view. This is the view inherent within the post-humanism philosophy.

Odumegwu et al. (2022) argue that the high elevation of humanism has placed more emphasis on reason, informed by altruism and empathy of the individual, while negating abstract realities. They see this anthropocentric view of humanism as the source of today's moral decay in society. However, in a somewhat paradoxical reawakening, Odumebwa (2022) concedes that humanism is the only system capable of inspiring human development, stating that "no future development will run contrary to humanism" (p.168).

The field of humanistic management as a focused research area emerged about a decade or so ago, led by scholars such as Melé, Pirson, Jensen, Dierskmeier, Foucault, Turnbull, Spitzeck, Acevedo (Koon, 2021; Wagner-Tsukamoto, 2018). Multiple conceptual framings of humanistic management prevailed as the concept developed over the years; however, the common thread is that of affirming the individual as an autonomous being, thereby recognising the rights, liberties, freedoms, and well-being of the human being. In its earliest development

phase, inspired by the work of Mary Parker Follett, the concept of humanistic management was understood as human-centred management practices (Koon, 2021). The approach was to develop management systems that treated people well to increase productivity (Melé, 2013). However, this approach was more economistic than humanistic as the focus was to increase productivity and profits. People were seen as tools to achieve that end goal. Treating people well in the workplace was equivalent to taking care of all production systems to ensure the smooth running of organisations, thereby achieving higher productivity.

Towards the end of the 20th century, management practices started to pay more attention to aspects of humanity and culture (Melé, 2013). Business management practices gravitated toward the recognition that, beyond human motivation, cultural conditions are also essential for organisational success. Management practices started to include the consideration of organisational culture and the environmental conditions within which people operate (Koon, 2021). This was a significant development in the historical development of humanistic management as an organisational philosophy as it was now drawing the movement closer to recognising human dignity, ethical decision-making, and active engagement with stakeholders Koon, (2021) as important pillars of humanistic management.

The current conceptual structure of humanistic management, although still under continuous construction, is understood to be based on principles of humanism that incorporate human flourishing, well-being, dignity, respect, recognising people's rights, caring and protection of people's interests (Matheson et al., 2021, p. 406).

Contemporary management theory and management practices, at the peripheral level, seem to increasingly align with humanistic approaches. Management theories such as Transformational Leadership, Authentic Leadership, Ethical Leadership, Servant Leadership, and even Paternalistic leadership have as their central focus an interest in the individual human as the centre of focus. Even legislated business practices such as corporate social investment,

corporate social responsibility, and environmentalism are based on the principles of putting the human factor and the environment in the forefront. However, these practices and corporate organisational approaches fall short of being humanistic management practices as their ultimate intention is to increase economic gain rather than the ideal of human empowerment and virtue. Humanism, at its core, puts the maximisation of profits aside and concerns itself solely with the human factor, where social value is determined not by the growth in GDP but by the value created in society (Nida-Rümelin, 2009).

Humanism as an Organising Imperative

Michael Pirson, one of the founders of the Humanistic Management Journal, wrote in an editorial of the same journal released in February 2018, that:

> the Journal focuses on how we can protect the dignity and promote well-being through our organising processes. With dignity, we refer to everything that has an intrinsic value, such as life and humanity, and therefore escapes the price mechanism or the "business case" logic. …how we can organize so that we protect the intrinsic value of life and promote wellbeing above a dignity threshold. (Pirson, 2018, p. 103)

This quote best demonstrates what humanistic management is all about and what it can achieve as a management practice when properly implemented within a business environment. However, other scholars have argued that implementing humanistic principles in business, as espoused in Pirson's sentiments, is utopian. Mejia (2019) argues that the moral demands of organising business activities are extremely high, such that if followed to the letter, would divert from the essence of doing business, and as such, it is not possible to achieve the objectives of business while at the same time focusing on the promotion and protection of human dignity. It is worth mentioning that there is a likelihood that this sentiment finds much amplification in the Big Science environment, which is the focus of this study; however, this notion will be thoroughly dealt with in a later section of this chapter.

The argument goes further to suggest that an organisation that has an organisational structure that is organised for the restoration, promotion, and protection of human dignity will

be burdensome to its employees as it will create a professional duty to restore, promote, and protect human dignity, thereby allocating extra, burdensome responsibility to all the employees in the organisation, thereby diverting from the all-important business imperative of maximising profit. Needless to say, humanists would be vehemently opposed to such sentiments as to them profit maximisation should come as a secondary imperative after the human elements have been taken care of.

Mejia (2019) intimates that humanistic management should be treated as a nice to have, rather than an organisational imperative. The focus on human dignity should be a personal moral consideration rather than an organisational requirement. Organisations that are motivated by a moral duty to restore, promote, and protect human dignity are going beyond the call of duty out of their own volition, but are not necessarily fulfilling an organisational imperative.

Other detractors of humanistic management may argue that integrating humanistic management as an organisational practice can be challenging to implement effectively in practice. Some of the potential drawbacks may include the risk of prioritising individual needs over organisational goals, difficulty in measuring the impact of humanistic practices, and potential conflicts between stakeholder interests. Additionally, critics may argue that the emphasis on humanistic values may be exploited or undermined in profit-driven environments.

To illustrate this critical view of humanistic management, Parker and McHugh (2013) conducted a study that highlighted the tensions between the ideals of humanistic management and the realities of organisational practices, particularly in profit-driven industries like advertising. The research found that there are potential challenges in terms of ethics and operational difficulties posed by the need to uphold humanistic methods while pursuing profits. They proposed that there should be a more balanced approach taking into consideration the power dynamics and ethical issues when implementing humanistic management principles.

This study, therefore, acknowledges that certain challenges do exist in organisational approaches that are based on humanistic management principles, but when implemented with care and assiduity, they can be beneficial. While Algera and Lips-Wiersma (2012) advocate for authentic leadership, which is similar to humanism in terms of operational intention and approach. They observe that the tension between organisational demands and the need to observe ethics in leadership and the demands of meeting organisational goals within time limits, may derail the true intentions of authentic leadership. They propose that this approach could work under a reorganised management and leadership setup where organisations are looking at group leadership rather than a single person at the helm.

Nevertheless, without downplaying the practical challenges of organising around a humanistic model, organisational success can be achieved with humanistic organisational approaches. It is necessary to consider humanistic management as a central tenet of organisational structure so that all organisational activities are arranged in such a way that they preserve the dignity of not only the employees but all stakeholders. There are strong arguments showing that organising differently is more likely to result in an economic crisis in the long run. Non-humanistic organisations tend to engage in unfettered misuse of resources which leads to ever-increasing inequality, decreasing levels of stakeholder trust which inevitably leads to lower levels of cooperation, motivation, and innovation among those entrusted with the responsibility of organisational performance, and the endless pursuit of material gain which continue to generate new needs thereby creating an endless cycle of materialism which erodes wellbeing and general satisfaction about life (Pirson, 2018). These factors, taken together, are more likely to spark instability not only in business but in society in general.

Furthermore, Pirson (2018) is justifiably insistent that “none of these problems will ultimately be resolved with incivility, and conflicts will emerge as a result of dignity violations” (p. 103). In the case of Big Science projects, Autio et al. (1996) have made it clear that these

projects risk the wrath of local communities if they do not protect the dignity of the people. Despite how Meija (2019) feels about humanistic management, it is still a necessity for the success of Big Science projects. Vázquez-Maguirre (2020) has found that the implementation of humanistic management principles, where the dignity of community members is restored through social innovation activities that focus on promoting good health and well-being, providing decent work to reduce inequality, and organising for sustainable social, economic, and environmental growth, results in building stable and sustainable rural communities with increased social value.

While humanistic principles can be valuable and beneficial in creating social value, there are well-known cases where organisations have faced significant challenges when implementing these principles without proper checks and balances.

Enron Corporation, for example, on paper seemed to espouse humanistic principles based on integrity, individual flourishing, and care for the customer (Roszkowska & Melé, 2021). To the outside world, Enron would have appeared to be a well-oiled humanistic machine, while in practice, the opposite was happening. The organisation, once an energy company hailed for its innovation and growth, collapsed due to unethical practices and a toxic corporate culture. Its emphasis on individualism and self-interest led to a lack of ethical oversight, resulting in financial fraud and accounting scandals. The pursuit of short-term gains and personal enrichment overshadowed the company's long-term sustainability, ultimately leading to its downfall (Kabeyi, 2020) .

The Lehman Brothers banking model, on the other hand, serves as an example of how the supposedly economistic approach to banking can apply humanistic principles. The humanistic approach within Lehman Brothers' banking model organised itself as a community that thrives by taking collective and individual responsibility for the common welfare of all. The bank was organised to support human flourishing by helping provide financial services to

improve the common well-being of the customers, employees, and the community (Valls Martínez et al., 2020).

However, due to a culture driven by excessive risk-taking, fuelled by a profit-oriented mindset and a focus on short-term gains, the bank had to file for bankruptcy in 2008, marking the largest bankruptcy in the history of the United States (Lioudis, 2019). The lack of checks and balances, combined with a disregard for the potential consequences, ultimately led to their failure.

Another example of the failed implementation of humanistic principles is Theranos, founded by Elizabeth Holmes. Theranos was founded on a social entrepreneurship model that aimed to revolutionise the healthcare industry by offering quick, inexpensive, and easily accessible blood tests using proprietary technology (Diamandis et al., 2022). However, the organisation's humanistic principles, such as the desire to provide affordable and accessible healthcare, were overshadowed by unethical practices and fraudulent claims. The company misrepresented its technology, leading to inaccurate test results and ultimately facing legal actions and dissolution (Diamandis et al., 2022)

Nonetheless, it should be emphasised that the failure and collapse of these organisations were not solely due to their incorporation of humanistic principles in their organisational models, but rather the misapplication or neglect of other crucial factors such as ethical behaviour, accountability, and a long-term sustainable approach. There is no doubt that when humanistic principles are applied within proper organisational management and leadership frameworks, positive results can be realised. It is, therefore, hypothesised that organising socioeconomic activities of the SKA project around humanistic management approaches and implementing them within the framework of social entrepreneurship will result in creating sustainable value in the rural communities of the central Karoo.

Humanism and Vulnerable Groups.

The extent of the literature reviewed shows that the broader focus of humanistic management research concerns itself with vulnerable groups, which include indigenous communities, women from disadvantaged communities, the youth, impoverished African communities, and other vulnerable groups. This subsection will highlight some of the prominent literature in these areas.

Indigenous communities are highly disadvantaged as they have been historically marginalised and excluded from the mainstream economy, largely due to colonialisation or a sheer undermining of their traditional ways of life, which were considered primitive or uncivilised (Camargo & Vázquez-Maguirre, 2021). The cross-cutting theme in the majority of research within the ambit of indigenous sociocultural issues is to make the case for ethical engagements that seek to move away from the preoccupations with the identity and individuality inherent in traditional leadership and focus on reaffirming the marginalised groups through humanistic management.

Asian, Middle Eastern and African communities are among the most researched communities in terms of the effects of humanistic management approaches in affirming indigenous groups in these regions. Vora and Kainzbauer (2020) investigated how indigenous and cross-cultural leadership behaviours in Thailand are related to humanistic practices. It was found that the Thai traditional cultural leadership characteristics of guiding, bridging, emotionally supporting, socialising, and communication and engagement with stakeholders were strongly linked to humanistic management. This implies that Thai cultural leadership is based on humanistic principles.

The study by Yang et al. (2020) can be seen as an extension of the Vora and Kainzbauer (2020) study, which looked at how traditional leadership practices can be integrated into a humanistic leadership model within the context of Thailand. Yang et al. (2020) examined the

link between traditional cultural practices and humanistic management within a traditional indigenous Chinese context. The approach was to follow the leadership style of prominent industry leaders to understand how cultural practices influence their approach to humanistic management. This study found that there is a strong link between Chinese cultural practices and humanistic management, and concluded that the Chinese Confucian philosophy is based on humanistic principles, an approach that is seen to create opportunities to connect ancient wisdom that has guided many generations over thousands of years to contemporary issues of sustainability and human well-being (Yang et al., 2020, p. 563). Confucianism is concerned with inner virtue, morality, and respect for the community and its values. This old Chinese religious philosophy is based on values of humanness, loyalty to one's true nature, reciprocity, and engaging in good conduct towards one's family and society at large (An et al., 2021; Lee et al., 2020). The link between Confucian values and humanistic management provides insight into the intrinsic values constituting humanistic management while providing a comparative model of analysis as to the approach and implementation of the practice.

While the foregoing literature shows that Asian cultural practices are aligned with humanism, there is a glaring contrast within African societies. Some studies conducted within the African context show that African cultural leadership practices are aligned with the suppression of human dignity and thus lack humanism (Ogo, 2019). The Ogo (2019) study intimates that African leadership culture is endowed with the spirit of control and subjugation within a culture of anachronism, supernaturalism, and authoritarianism, which undermines human dignity and thus misaligns itself with the characteristics of humanism identified in most of the Asian-aligned literature.

The high rate of ethnoreligious conflicts in Africa and the general lack of development are some of the consequences of the culture of dignity deficiencies in African leadership approaches. The prevalence of these oppressive leadership tendencies in Africa could be

associated with the era of colonialism, which was aimed at political, psychological, and social control of the natives to perpetuate the political hegemony of the coloniser. Society's demand for the restoration of the dignity and identity of the people as legitimate and worthy human beings within the African context is met with repressive responses from leadership, sometimes imbued with lethal force, that prevails within the spread of conflicts in most of the African states. Ogo (2019) suggests that philosophical decolonisation can help to realign African culture with values of human dignity and social order and restore the quality of life in African societies. A compelling proposal from this study for the African social context is the restoration of social order and political integration that will strengthen the social institutions based on good and purposeful leadership, effective systems of social justice, and a strong civil society. African societies stand to assume the identity of viable modern states built on common citizenship, shared nationality, and common interests and values. This can be achieved through dialogue and strengthening of the concept of the citizen as a stakeholder in building social order, which has been identified as a core pillar of humanism and the restoration of human dignity (Ogo, 2019).

A further attempt to integrate the principles of humanism with the African context was found in the study by Odari (2020). The study proposes the integration of humanistic principles within the Kenyan education system through a combination of cultural philosophies from the Japanese and African cultures. The Japanese Soka philosophy advocates for education for value creation, whilst Ubuntu is an African philosophy that seeks to foster togetherness and collective humanity. Odari (2020) proposes that these two philosophies are integrated into the Kenyan education system to foster global citizenship while developing a humane Kenyan society. Odari, (2020) intimates that the inclusion of Ubuntu and the Soka philosophy into the Kenyan education system will position educators as agents of change toward a more humanistic society.

An education system that combines the principles of the African Ubuntu tradition with the Japanese Soka philosophy has the potential to develop a society that is aware of self, has a sense of meaning, and enhances existence, which manifests in selfless giving and working towards the well-being of others (Odari, 2020).

The education system and its schooling environment are recognised as the perfect platform to cultivate humanism. It positions teachers as role models of the social aspects of humanism, while the teaching and learning process reaches the broader population of youth, attuning them as future leaders of change, thereby creating empowered future leaders who are guided by humanistic principles to create a peaceful and inclusive society (Odari, 2020).

The other group of vulnerable people that received the attention of humanistic management research is students, specifically those involved in athletics. Caulfield et al. (2023) believe that the management of students involved in athletics is based on the economistic model, where the student-athlete is seen as a means to generate revenue for the institution and the athletics organisation. Caulfield et al. (2023) found three main challenges faced by student-athletes. Firstly, the athletes are not recognised and paid as professionals, but their effort generates income through sponsorship and participation in competitions. The other challenge lies within the power dynamics between instructors and student-athletes, whereby an almost fear-based expectation to win is cultivated, thereby affecting the students' psychological disposition while creating ethical conflicts. The third element involves the extent of limits to which instructors can push students to exert themselves mentally and physically to win. The researchers believe that within a humanistic framework, the necessary motivation for athletes to win, in ethical and dignified sporting settings, can be achieved with similar results attained without any affronts to the dignity and well-being of the students.

Another study conducted by Whitehead and Senecal (2020) highlights further challenges faced by student-athletes as they strive for excellence in sports. Student-athletes face existential

challenges at three levels: the first level is health-related, where the athlete sacrifices the enjoyment of a fulfilling and healthy lifestyle while pursuing athletic excellence at all costs. Secondly, the athlete loses out on living a rich and meaningful life as youth would provide, while dedicating their life to the pursuit of achievement, and thirdly, student-athletes lose out on a meaningful life structure that has a balance at the psychological, mental health, and physical realms. The researchers propose a humanistic approach that focuses on the existence of the athlete as a dignified human being to address the challenges of imbalance in the life, well-being, and athletic prowess of the students.

A Broader Perspective of Humanism.

One of the areas identified to have major dignity affronts directed toward indigenous groups is tourism management. Camargo et al. (2022) suggest that there are prevailing dignity impunities of local indigenous people, more especially through employment patterns in the urban tourism sector. Camargo et al. (2022) conducted a study to test the role of dignity and humanism as a conceptual basis for the restoration of dignity within a Mexican indigenous community. They propose that changes in employment patterns across the economic, sociocultural, and psychological dimensions can alleviate the scourge of dignity violations in indigenous communities.

The study was motivated by the precarious conditions of indigenous people in Latin America. Indigenous people in Latin America tend to migrate into urban areas to pursue opportunities for improved quality of life. However, most of them are employed in the highly perilous sectors of domestic work, street vending, and entry-level menial positions in the tourism sector. These jobs continue to perpetuate historical and institutionalised exploitative practices such as discrimination, subordination, and exclusion, which lead to perpetual poverty, overall leading to perpetual dignity affronts. Several studies have shown that tourism has the potential to increase economic growth and restore the sense of pride and dignity among the

marginalised, for instance, Carbone (2020) suggested that tourism has the potential to play a role in human development, intercultural dialogue, and sustained peace. The opportunity presented by tourism to create economic development by using natural artefacts, cultural practices and geographic features that are unique to a specific area allows for even the most disadvantaged of communities to benefit. Sari et al. (2021) have shown that preserving local cultural knowledge and heritage for tourism purposes can increase the economic welfare of local people. However, economic development can only accrue to the local communities if they are included in the tourism management processes and involved as equal partners in the enterprise, while managing the process in a humanistic approach (Della Lucia et al., 2021). However, without humanistic principles applied in tourism management, tourism is highly likely to erode the cultural heritage of indigenous groups, largely through the unilateral commodification of indigenous culture and marginalisation (Camargo et al., 2022).

The tourism sector has been recognised as providing vast opportunities for economic growth, but also provides opportunities for social interactions, offering great opportunities for the integration of humanistic management approaches within those interactions internally across the providers of tourism services and horizontally across the customer base. The dignified approach within the management and interaction dynamics is more likely to increase repeat product usage, thereby increasing tourism revenue while facilitating social cohesion and harmony. While tourism offers great opportunities for economic development, it also offers a fertile ground for unethical practices that treat human beings as a means of production. A case in point is the practice of using indigenous or poor people as products for tourist attractions without their consent and without them benefiting from the proceeds of the tourism activities (Camargo & Vázquez-Maguirre, 2021). A good example is the case of the open tour bus in Cape Town, which drives through the informal settlements of Khayelitsha and Langa, allowing tourists to have firsthand experience of the daily lives of shack dwellers. The people of Langa,

their way of life, and their unique living environment are used as a source of tourist attraction while they do not benefit from the proceeds of those activities.

Camargo and Vázquez-Maguirre (2021) identify several practices within the tourism sector that have the potential to undermine the dignity of indigenous people, these include access to sacred sites without the necessary permissions or the observance of cultural practices that are meant to preserve and maintain the sanctity of the places, omitting the narratives, views of the local people, and the general lack of recognition of the local people as key stakeholders in the development of local tourism and its governance. These practices take away the economic opportunities from the local people, degrade their environment, and undermine their well-being and dignity.

Nonetheless, the sustainable tourism movement increasingly pushes for the integration of humanistic approaches to tourism management and implementation to achieve the greater good for all. The study conducted by Camargo and Vázquez-Maguirre (2021) proposes a humanistic approach, putting the protection of dignity and the preservation of the sociocultural conditions of the local people high on the agenda when implementing a mega project within indigenous, rural, and marginalised communities to restore and protect the wellbeing of the local people. The application of certain guiding principles for humanism in tourism, namely, consultation and integration, self-determination and self-control, decent and meaningful tourism work, prioritisation of entrepreneurial opportunities for local people, and recognition and oneness, can increase the local people's sense of justice, thereby protecting their freedom, self-worth and affirming their autonomous capacity as dignified human beings.

A paper by Della Lucia et al. (2021) proposes new pedagogical approaches to the teaching and training of future managers within the tourism sector, which include teaching humanistic management approaches that are underpinned by human dignity and social well-being. Della Lucia et al. (2021) argue that this kind of training will help to develop responsible

tourism managers who are ethical but also have an acute awareness of the social, cultural, and environmental challenges inherent within the sector to develop intuitive approaches in dealing with those. These managers will be active agents of social change, who are consciously aware that tourism is about people and its development depends on the dignity afforded to the recipients of tourism services. These managers will drive tourism as an industry that has a significant impact on the global economy and societies all over the world. However, the paper recognises that implementing a change process that involves incorporating humanistic practices into higher learning programmes might be very challenging. Time, resources, and the buy-in of all stakeholders are required for the programmatic approach to succeed. Cross-cultural differences, more especially within an international context, and a general hesitancy to engage in new and unfamiliar learning and teaching formats might pose even further challenges.

The study was conducted in three universities; as such, more universities across multiple cultural dispositions and orientations might need to be involved in further studies to establish a broader understanding of the complexities involved in integrating humanistic management training into tourism education. Longitudinal studies might also be necessary to understand the long-term effects and outcomes of these new pedagogical approaches on students and practitioners.

Humanism and Leadership.

The concept of leadership has been researched and discussed extensively in scholarly circles, such that a fairly comprehensive development of the subject has been established. Various theories and styles of leadership have been explored to the extent that a fairly good understanding of effective leadership styles and the core principles that are responsible for their success has been established. The works of writers such as (Bennis & Nanus, 1997; Covey, 1992; Goleman, 1998; Northouse, 2021), just to sample but a few, they went to great lengths

to unpack the concept of leadership, highlighting the role of principles and values such as integrity and ethics, emotional intelligence, people-centeredness, mentorship, continuous learning and many other leadership characteristics that constitute effective leadership within various leadership styles. Within leadership discourse, it becomes increasingly apparent that humanistic principles are strongly aligned with effective leadership. Pirson and Lawrence (2010) noted that transformational leadership is closely aligned with humanism as a management philosophy. Both humanism and transformational leadership approaches are based on four common pillars: the drive to create a climate of emotional and psychological connection with the purpose of the organisation, the drive to maintain long-term relationships, the drive to create financial value, and the drive to defend the organisation against competition. However, humanistic leadership goes beyond the four drivers and influences change outside the organisation into the broader society.

Some of the literature dealt with earlier in this thesis has shown that there is a strong link between humanistic management and leadership characteristics of traditional and cultural societies. Anadol and Behery (2020) followed and analysed the leadership style of a well-known humanistic leader in the United Arab Emirates. The prominent leader's leadership style was analysed from a humanistic leadership lens to understand how humanistic leadership behaviours are applied in an organisational setting. The leader and his followers were interviewed to identify themes within their leadership and follower relationship that represented humanistic management within the UAE culture. It was found that the humanistic leadership approach was characterised by elements of humility, respect, care, fairness, transparency, well-being orientation, generosity, and family focus. These are characteristics defining cultural leadership in traditional Middle Eastern societies.

A similar study was conducted by Kim et al. (2020), determining the leadership characteristics within the South Korean cultural context that represented humanistic leadership.

A comprehensive analysis of the leadership style of a prominent South Korean leader, Mr Kook-Hyun Moon, was conducted to see how it links to humanistic management. The study found that Mr Moon exhibited humanistic leadership characteristics informed by respect for all mankind, seeking the greater good for all, sincerity and building trusting relationships with stakeholders, and continuous learning and innovation. These characteristics are common in the philosophy and values of South Korean culture. The study reveals that an understanding of local culture and its philosophical underpinnings is essential in building a humanistic culture in leadership.

The characteristics of cultural leadership identified in the preceding literature and linked to humanistic management have been found in other instances as key to organisational development. Del Baldo (2020) conducted a case study on a large and profitable company in Italy that was perceived to have a coherent, authentic, and successful CSR programme. The case study revealed that through the application of culture-based humanistic leadership principles, the organisation was able to establish a culture and system of coherence and shared objectives guided by a system of "soft" intangible values that represent the living core of the entire organisation. The application of humanistic management principles in the organisation results in sustainable growth.

Humanistic leadership, therefore, is not necessarily a leadership or management style but a philosophical perspective that provides the basis for the integration of people and society-oriented leadership. Its characteristics and practices facilitate effective leadership that goes beyond organisational success but also positively impacts the community and the well-being of the collective society.

Humanism and Dignity

The first postulate of Robert Hanna's broadly Kantian theory of human dignity holds that human dignity really exists, and any individual who claims not to believe in human dignity,

attempting to refute the universal existence of human dignity, will inevitably argue against his/her dehumanisation by arguing against the protection of his/her dignity (Hanna, 2021). Even to the sceptic, therefore, human dignity does exist, as such "dignity is a universal, egalitarian, and performative moral norm that indicates the need for respect for the humanity of every individual" (Zawadzki, 2018, p. 174).

The next consideration, after accepting that every human being has dignity and people's dignity should be preserved, protected, and promoted, would be to examine ways of incorporating dignity aligned management practices within the business environment. Organisations should continue to explore and formulate approaches within their organisational structure that will contribute to the protection of human dignity. Zawadzki (2018) suggests that profitability can be realised as a product of the ethical and dignity-based business environment, implying that when people function within an environment that is organised in such a way that it places their dignity at the forefront, they are likely to flourish and perform to the best of their ability, thereby increasing the economic output of the organisation. This fact has been proven numerous times when using people-oriented management approaches such as transformational leadership, authentic leadership, ethical leadership, servant leadership, and legislated business practices such as corporate social responsibility and corporate social investment. The success of these leadership and management approaches lies in the central theme of putting the individual at the forefront. However, the downside of these approaches is that they are designed and implemented with the ultimate intention of increasing economic gain rather than the ideal of human empowerment and virtue (Spitzeck et al., 2009).

Besides the economism pushback described by Spitzek et al. (2009), Thomas and Lucas (2019) cited extensive literature that shows how the undermining of dignity in the workplace undermines progress and impedes human flourishing. The literature examined in this regard includes the works of Khademi et al. (2012) on the abuse and humiliation of nurses; Baker and

Lucas (2017) on the social and career harms inflicted on LGBTQ employees; Nelson and Lewis (2016) on the undervalued occupational status of child care workers; Purser (2009) on the economic insecurity of day labourers, and many others showing how undignified working conditions and environments undermine progress (Thomas & Lucas, 2019).

The approach to protecting human dignity in the workplace lies at the centre of the definition of dignity itself. According to Etinson (2020), human dignity has to do with honouring a person's social status as opposed to humiliating or degrading them (p.365). Furthermore, Laszlo (2019) adds that dignity is an intrinsic human value that is beyond any price and has no equivalent materialistic replacement (Hanna, 2021). The treatment of human beings as objects of economic benefit, and perhaps pushing the argument a little further, putting people as equivalents of other production systems by referring to them as "organisational resources" as in the concept of human resources, is equivalent to degrading human dignity and is not humanistic in nature. As proposed by Etinson (2020), upholding people's dignity means treating them with respect as opposed to treating them like mere objects, observing and respecting people's environment, culture, and norms, and creating an environment that prevents emotional, spiritual, and physical harm. Social entrepreneurship and social innovation are considered a perfect vehicle for the preservation of human dignity.

Camargo and Vázquez-Maguirre (2021) argue that the only approach to practising humanistic management within an organisational setting is to preserve human dignity. They observed from a variety of literature that humanistic management practices that observed the preservation of human dignity led to economic flourishing in the West. They argue that management practices that prioritise human dignity will have no room to view or use human beings as instruments of production, which is the essence of humanistic management. This means, therefore, that whenever humanistic management practices prevail, human dignity is preserved and upheld. Humanistic management has the power to reorient leaders into seeking

innovative ways to restore human dignity, thereby positioning human value as a source of innovation that creates social value, especially in social entrepreneurship settings.

Humanism and the SKA Project in the Karoo

The preceding literature review points to several areas that relate to the characteristics of the focus area of this research. The literature by Camargo and Vázquez-Maguirre (2021), Vora and Kainzbauer (2020), and Yang et al. (2020) show that indigenous communities run the highest risk of having their dignity undermined in many organisations as they are seen as inferior. These works have shown that humanistic approaches possess the potential to address the plight of marginalised indigenous groups. These studies were conducted within marginalised indigenous societies and showed that the application of humanistic management principles when interacting with these communities restores and protects their dignity. Sustainable tourism is the best vehicle to accelerate economic development in these areas while integrating humanistic management principles in the management of tourism to reverse the dignity affronts inflicted on these groups of people.

Furthermore, the literature showed that over and above the marginalisation of indigenous people, vulnerable groups such as the poor, the youth, and women usually fall victim to dignity affronts. The literature has suggested that the application of humanistic principles when dealing with these groups and also instilling the culture of humanism through the schooling and higher learning system will contribute to the restoration of human dignity.

The literature further showed that, generally, African societies are prone to dignity violations and lack humanistic approaches in their leadership style, as opposed to most Asian and Middle Eastern societies. Leadership characteristics of some Asian and Middle Eastern leaders were found to be related to humanistic management. Even though African societies recognised the philosophy and spirit of Ubuntu, which calls for togetherness and respect for humanity, literature has not found the explicit application of these principles in practice.

Instead, researchers such as Ayiro (2010), Lekhanya (2015), Odari (2020), and Ogo (2019) suggested that there is a lack or weak presence of humanism within the African context.

The study by Caulfield et al. (2023), even though conducted within a student-athlete setting, shows that whenever humanistic management principles are applied, the foremost objective is to preserve human dignity. The study showed that managing student athletics within a humanistic environment preserves the dignity of the student rather than seeing them as commodities for economic gain. Similarly, this thesis takes an approach that, by dealing with indigenous people of the Karoo within a humanistic environment and treating them as worthy human beings, as opposed to seeing them as a means to accomplish the goals of the SKA project, will preserve their dignity while ensuring positive gains for both the project and the community.

The small Karoo towns of Carnarvon, Vanwyksvlei, Brandvlei, and Williston, which host the SKA project, are part of the Karoo region, which was inhabited by the indigenous |Xam people as early as the 18th century (Parkington et al., 2019). Although the |Xam were displaced under colonial subjugation and driven into the periphery of the rich Karoo territory and forced to work as farm labourers and slaves, the |Xam culture and heritage still dominate these areas.

The |Xam are originally hunter-gatherers who had a special and spiritual connection with nature and their environment, including the animals, plants, valleys, hills, mountains, and stars in the sky. To them, the inanimate elements of the environment were as much a part of their spiritual makeup and played a role in how they interpreted their completeness of life.

The animistic temperament to land and the environment by the |Xam positions the land that provides their hunting ground, their source of food and shelter as more than a mere environment, but a living being that is animatedly linked to their spiritual existence. Much of the land in the Karoo is open, bare, and sparsely occupied. Atkinson (2008) recorded that the Pixley ka Seme District Municipality, which is the main host of the SKA project spans an area

of about 960 square Kilometres but is occupied by only 164 thousand inhabitants. This translates to about 2.3 people per square meter, compared to the occupancy rate of 22 people per square metre in Gauteng. The thinness of occupation, combined with the low contribution to the GDP from these areas, only 10% as observed by Atkinson (2008), renders the Karoo politically and economically insignificant in the country. As a result, decisions for land use would be taken without the active involvement of the indigenous people, thereby leading to decisions that are against their cultural heritage considerations.

The implementers of the SKA project considered the land only from a scientific research point of view and deemed it fit to declare legislation that restricts the activities of the Indigenous people without consideration of their spiritual connection to the land (Walker, 2019). The Astronomy Geographic Advantage Act of 2007 identifies areas in the country that are suited for both radio and optical astronomy activities and provides sweeping powers to the minister responsible for science and innovation to declare regulations that restrict activities that could have a detrimental effect on astronomy activities. In the Karoo, for example, the area where the SKA project is being built is declared as a radio quiet zone, and the use of any radio frequency emitting device is prohibited. Further to the restrictions, over 130 thousand hectares of land have been declared a National Park under a land management scheme that restricts any form of public access to the area.

Parkington et al. (2019) take the view that the presence of the SKA might be viewed by the descendants of the |Xam as a violation of their pristine environment and an infringement on their traditional beliefs and interpretation of the universe. On many occasions, Parkington et al. (2019) refer to the presence of the SKA in the Karoo as an intrusion, claiming to signify the dominant attitude of the indigenous |Xam community.

Walker (2019) observes that most of the Karoo, and those closer to the core of the SKA telescope, are generally plagued with social problems, which include high unemployment, with

the majority of households depending on social grants. Other problems include substance abuse, low levels of education, and a myriad of health and social problems associated with poverty. Although there are pockets of positive developments in the areas as a result of socioeconomic programs implemented by the project, Parkington et al. (2019) are of the view that the positive developments proposed by the SKA project are not aligned with the needs and aspirations of the indigenous people. Parkington et al. (2019) are of the view that the natives might see these initiatives as mere gestures designed to divert attention and soften them up so that they do not oppose the negative effects of the scientific endeavour on their culture. The prevailing view on the ground is that these sentiments are being ignored by the management of the SKA project (Pakington et al., 2019).

Regarding the matter of opportunities for economic development, Jacobs et al. (2019) propose that the Karoo towns stand a better chance of accelerated economic development by using the advantage of astronomy that already exists due to the presence of the SKA project and other astronomy installations to drive tourism. The earlier cited literature has shown that tourism provides vast opportunities for economic development in marginalised communities. It has also emerged from the literature cited earlier, Sari et al. (2021), for example, that Indigenous communities can use their culture and heritage as a source of tourist attraction. Jacobs et al. (2020) echo similar sentiments, proposing that the Karoo should combine its cultural heritage and its unique farming techniques while embracing new and developing technologies to create attractive tourism packages.

The literature thus makes a strong case for the application of humanistic management principles in rural, impoverished, and marginalised communities, taking advantage of the available resources and strengths within the local environment to restore the dignity of the local people while creating social and economic value. This study, therefore, seeks to rely on the aforementioned literature to build a humanistic approach framework that will intervene in the

social conditions of the indigenous people of the Karoo, using the SKA project as a vehicle for the implementation of humanistic principles within a social entrepreneurship environment.

Social Entrepreneurship

Humanistic management is closely linked to social entrepreneurship in that, as it has been established earlier, its primary driver is to counter the business management approach, which prioritises profits at the expense of human dignity, what most researchers call the economistic model (Laszlo, 2019; Matheson et al., 2021; Pirson, 2018; Pirson, et al., 2019; Pirson et al., 2009; Pirson & Lawrence, 2010; Spitzeck et al., 2009), while social entrepreneurship is motivated by the need to address social problems with economic gain as a secondary outcome (Gupta et al., 2020). It would naturally follow that the application of humanistic management principles to tackle social problems, using social entrepreneurship as an enabling mechanism, more especially in rural communities where conditions that tend to degrade human dignity persist the most, social value and sustainable development are restored and upheld (Jain, 2012).

Gintere and Licite-Kurbe (2022) identify three stages of the development of social entrepreneurship. The first stage appeared in the nineteenth century to the early twentieth century. This stage was characterised by actions of humanism championed by religious movements and philanthropists. During this stage, according to the findings of Gintere and Licite-Kurbe (2022), there was no research conducted in the area of social entrepreneurship, and such deeds were not directly or explicitly referred to as social entrepreneurship; words such as philanthropy were used instead.

The second stage came around the 1950s with the rise of social and political movements that were emerging against the rising social discrimination of various groups. Gintere and Licite-Kurbe (2022) observed that terms like social responsibility and social entrepreneur were appearing in literature at that time but were not widely used to refer to these activities.

The third stage of development of social entrepreneurship kicked in around the last quarter of the twentieth century, with the phrase “social entrepreneurship” starting to appear widely in literature. The development of the concept came with a move towards establishing business ventures that are focused on solving social issues. Many organisations that were dedicated to dealing with social problems emerged and adopted an entrepreneurial approach to dealing with social issues. Scholarly research on the concept gained traction, and academic programmes were introduced to teach social entrepreneurship. Research in the field has continued to yield multiple definitions and conceptual formulations of the phenomenon, and to date, no clear consensus has emerged regarding its definition.

Social entrepreneurship has been an elusive concept to those who have attempted to define it. Bandinelli (2019) observed that Alex Nichols, one of the editors of the Journal of Social Entrepreneurship, considered social entrepreneurship to be lacking clear academic legitimacy and still a fuzzy construct. Perhaps what made Alex view social entrepreneurship as a fuzzy construct was the fact that, after several years of its development, there was still no clear consensus as to its definition (Bandinelli, 2019). Morris et al. (2021) reported the existence of more than thirty published definitions of social entrepreneurship. Even though they further attempted to search for common elements within these definitions, they still could not provide a single agreed-upon consensus as to what social entrepreneurship is. However, despite the many theoretical perspectives of what social entrepreneurship is, there have been numerous recorded successes in achieving its primary intentions. The multiple views about what constitutes social entrepreneurship may be hindering progress in the empirical development of the subject as a predictive theory, but at a practical level, the multiple views help to enhance its practice and implementation. Morris et al. (2021) agree that the multiple conceptual approaches contribute to the richness of the field in solving societal problems as they offer multiple practical approaches for implementation. This view is supported by the

findings of Chliova et al. (2020) that multiple meanings within a category, such as social entrepreneurship, do not necessarily limit its development but allow it to continue to thrive within divergent views of meaning. Bandinelli (2019) suggests that perhaps the lack of a singular and coherent paradigmatic approach to social entrepreneurship may be its strength, as the practice will be theoretically diverse and flexible in its approach and implementation to be useful in different forms and shapes as a method to solve social problems and deliver social value. Another perspective in support of the definitional deficiency of social entrepreneurship is that it allows the practice to thrive in different regions of the world, implemented in varying social, geographical, and cultural contexts and conditions (Gintere & Licite-Kurbe, 2022).

An example of how the approach to social entrepreneurship can be flexible and diverse can be found in Shukla (2020), describing how Professor Muhammad Yunus, an accomplished economics professor who started the Grameen Bank, got involved in social entrepreneurship and won multiple awards for his initiatives, but never considered or described himself as a social entrepreneur, nor did he set out to consciously involve himself in social entrepreneurship. Without consciously setting out to engage in social entrepreneurship, Professor Yunus decided to start giving personal loans to poor people who could not secure bank finance. The professor went on to establish a bank that would provide low-cost loans for housing, business, and education to the poor, and even gave loans to the destitute and beggars. Professor Yunus was motivated by the realisation that the mainstream banking system does not assist the poor, even though they are the ones who require financial assistance the most. He believed that even the poorest of the poor could be lifted out of poverty if proper financial assistance were provided. In the process of assisting the poor, he took several people out of poverty and helped many to establish businesses while making a profit through his banking business. For these initiatives, the professor received an award for social entrepreneurship, even though he was not aware that he was doing social entrepreneurship. The flexibility of operating outside a defined ontological

framework made it possible for his good deeds to be classified as social entrepreneurship while shaping the contextual discourse as to what constitutes the practice.

This thesis will not attempt to add to the multitudes of existing definitions but will focus on the outcomes of entrepreneurial activities implemented within a social setting, with the main objective of tackling social issues to create sustainable value. In the case of the SKA case study, the prevailing social issues include unemployment, low levels of literacy, high levels of poverty, and the provision of basic services within the focus area.

Field Analysis

This section will analyse and critique research articles in the field of Social Entrepreneurship focusing on the following themes: (1) the prevalent nature of societies in which research on social entrepreneurship is conducted and factors influencing the choice of such settings, (2) the common approach and methodologies applied in the research, (3) issues within the societies that are likely to impact on the research, (4) common conceptual assumptions and hypothesis being tested in these researches, (5) common results and findings. Each section will present data, conduct an analysis of trends threading through the analysed research sources and develop a position relevant to the current research. It is expected that the analyses and synthesis will help craft a perfect approach to be used in the Karoo setting which is the focus of this case study and also highlight important issues that are likely to impact this study. The five sub-themes identified above will form the basis of discussions in the next section of this chapter.

Analysis of Social Settings

Several bibliometric analyses of the social entrepreneurship research ecosystem, for example (Bansal et al., 2019; Dionisio, 2019; Hota et al., 2020a; Tan Luc et al., 2022; Yesmin et al., 2021) show that research into the field started in earnest some fifteen or so years ago, as such it is a research field that is still in its infancy. Social entrepreneurship as a practice may

have been around for decades now, but it only started to receive scholarly attention and prominence within academic circles quite recently. Most of the research, as observed by Hota et al. (2020) is largely focused on the conceptual explication of the phenomenon; there is a minuscule amount of literature in the practice domain of the field. The entirety of the literature reviewed agrees that there is no consensus as to the definition of social entrepreneurship but agrees that social entrepreneurship has to do with implementing social entrepreneurial activities that are concerned with social value and addressing some or other social problem or issue. Hakami (2021) postulated that social entrepreneurship contributes to social development and went on to empirically establish that over and above social development, social entrepreneurship contributes in areas of society that are more likely to be accompanied by several problems while there is usually low government intervention, such as community health, handling of industrial waste, development of business skills, adult education, and similar areas.

The research by Sultan et al. (2018) confirms the positive mitigative role of social entrepreneurship in the reduction of poverty. The same study relies on previous studies by Chebbi (2016), Daniel and Lenain (2014), and Connor et al. (2016), which qualitatively proved the connection between social entrepreneurship and poverty alleviation and found a similar trend in the region of Marden in Pakistan. Over and above the role of social entrepreneurship in community development, Sonmezoglu (2022) found that those who engage in social entrepreneurship do so without any pecuniary considerations but are motivated purely by their individual social responsibility. Almost all research material analysed in the earlier mentioned bibliometric analyses (Bansal et al., 2019; Dionisio, 2019; Hota et al., 2020; Tan Luc et al., 2022; Yesmin et al., 2021) shows research in social entrepreneurship as focusing on its intervention in dealing with social issues or problems. It would be expected, therefore, that social entrepreneurship as a social practice is prominent in the developing world, given that

social problems are prevalent in areas where governments have less capacity or no interest in addressing them. A large proportion of social entrepreneurship research was found to come from Europe (Bansal et al., 2019) and the US (Savitha et al., 2022), with modest contributions from Asia and North America. Some literature was identified in South Africa (Lekhanya, 2015) and Kenya (Ayiro, 2010), although the study focused on the effects of social entrepreneurship in mitigating the impact of HIV/AIDS in the country. The studies identified in Asia are mostly located within rural regions of the sub-continent

The research by Sultan et al. (2018) confirms the positive mitigative role of social entrepreneurship in the reduction of poverty. Over and above the role of social entrepreneurship in community development, Sonmezoglu (2022) found that those who engage in social entrepreneurship do so without any pecuniary considerations but are motivated purely by their individual social responsibility. Almost all research material analysed in the earlier-mentioned bibliometric analyses (Bansal et al., 2019; Dionisio, 2019; Hota et al., 2020a; Tan Luc et al., 2022; Yesmin et al., 2021) shows research in social entrepreneurship focusing on its intervention in dealing with social issues or problems. It would be expected that social entrepreneurship as a social practice would be prominent in the developing world, given that social problems are likely to be prevalent in countries with governments that have less capacity or a lack of interest in addressing them. However, a large proportion of social entrepreneurship research comes from Europe, Asia, and North America (Bansal et al., 2019), while a large number recorded by Savitha et al. (2022) was from the US. Yesmin et al. (2021) found that the top five countries according to the number of papers published are the US, the UK, Australia, Canada, and Germany. The reason advanced in the literature for this geographic trend is the propensity of these regions to mobilise resources to support social entrepreneurship, a sentiment that emerged from Hakami (2021), Polovko (2022), and Soegiono et al. (2019) about the importance of financial, government and policy support for social entrepreneurship to

thrive. The regions that saw a high degree of development in social entrepreneurship research and implementation could have been high on these support structures for social entrepreneurship. An alternative explanation offered by Yesmin et al. (2021) is that developed countries tend to face high levels of unemployment. It is worth mentioning that some literature was located in Africa, mainly in South Africa (Lekhanya, 2015) and Kenya (Ayiro, 2010), albeit the Kenya research focuses on the effects of social entrepreneurship in mitigating the impact of HIV/AIDS in the country rather than poverty issues. This confirms that, irrespective of the area in which social entrepreneurship research is conducted, the ultimate objective is related to an intervention in some sort of social issue.

Although there is an identified regional development in social entrepreneurship research, most of it is based in rural areas for the reason that social entrepreneurship is seen as a perfect solution for problems affecting rural areas. The available literature, therefore, supports the setting of this study in the rural upper Karoo in South Africa. Among other issues, the study will endeavour to investigate the effect of social entrepreneurship activities in alleviating poverty in the rural Karoo. It will be shown later in this dissertation that reducing poverty is linked to the creation of social value, which is the ultimate objective of this study.

Conditional Antecedents of Social Entrepreneurship

The conundrum of implementing social entrepreneurship in a capitalist society is well illustrated by Bandinelli (2019), using the example of three young graduates who struggled to make a breakthrough in social entrepreneurship while trying to make ends meet for themselves. The motivation for these graduates to enter into the social entrepreneurship space was to find meaningful work for themselves, but also to take the opportunity to solve some social problems, as they were either unemployed or doing menial work that they didn't like. The social entrepreneurship space seemed attractive to them as they would provide solutions for

society while they made an income for themselves, but they faced multiple difficulties. The moral dilemma posed by this situation is captured in this illustration:

> "The young social entrepreneur is caught in a paradoxical position similar to one who is watching a documentary on climate change, on a MacBook Pro assembled by exploited workers, eating a chicken breast full of hormones, which has been cooked using fossil fuel, and purchased in a supermarket that has been reached driving a car that needs petrol to work, and whose owners may well invest in toxic derivatives" (Bandinelli, 2019, P. 98.)

This quote illustrates the struggle between survival within a capitalist system while driven by a need to make positive changes for society. This struggle as Bandinelli (2019) puts it, is a struggle to break the chains of neoliberal capitalism, operating in an environment where one has to make money while doing good, like having to drive around in a car that runs on petrol when going to preach the message of environmental conservation, one is a necessary enabler in the society we live in while the other is a necessity to save the environment, but these necessities are starkly working against each other. This oxymoronic situation inevitably led to the lack of success in the student's endeavour for social entrepreneurship.

Bandinelli (2019) suggests that social capital is a precondition for success in social entrepreneurship, the literature provides examples of aspiring social entrepreneurs who used the Impact Hub, which is an international network that offers coworking spaces for aspiring social entrepreneurs, as a place to build their social capital through friendships and understanding of each other, which led to better collaborations in social entrepreneurship ventures. Impact Hub offers aspiring social entrepreneurs a place to meet in an informal setting, interact with each other, encourage each other, collaborate, and exchange experiences and knowledge, which brings together individuals to be part of a community with shared trust and friendships that enable them to co-create opportunities. The activities and sessions at Impact Hub foster values of collaboration and sharing, which are believed to be the necessary characteristics of social entrepreneurship.

The work done by the Promoting Youth Social Entrepreneurship (PROMYSE) project also sheds some light on the prerequisites for social entrepreneurship. The natural assumption is that an inspiring social entrepreneur needs to be in a similar socioeconomic situation to that which one intends to address (Gavrielides et al., 2019). One needs to have experience of unemployment and being economically disadvantaged to have an interest and succeed in dealing with social issues related to creating employment. Hence, a group of youth qualifying in that criterion was identified and selected for training through the PROMYSE project to be social entrepreneurs. These young aspirant entrepreneurs needed to be trained but also mentored to become successful entrepreneurs. The training focused on, among other issues, how to identify social issues that require intervention and how to set up activities for social value and impact, but also provide opportunities to make profits (Gavrielides et al., 2019).

Social entrepreneurship is not only done by individuals, but such characteristics that lead to or constitute social entrepreneurship are also identifiable in organisations. The published work by Shukla (2020) discusses many cases where social entrepreneurship is evident in organisations. Shukla (2020) identifies cross-subsidisation as one of the methods applied as a social entrepreneurship strategy used by an eye care facility in India. The facility charges different prices for people in different economic sectors while using their price mechanism and volumes to allow the facility to offer high-end eye care services to the poor for free. Another example of cross-subsidisation is used by an ambulance service, which charges a higher fee for patients going to a private hospital so that it can offer the service for free to poor patients going to public hospitals. A further example of cross-subsidisation quoted in Shukla (2020) involves using profit margins accruing from a high-end product to subsidise the operations involved in supplying the lower-end version of a similar product. Through this method, for instance, an eye specialist organisation was able to provide low-cost eye spectacles to poor and remote

people, some of whom were small business owners such as tailors, rug makers, bike mechanics, weavers, and artisans, and they were able to continue to make a living in their small businesses.

Other forms of social entrepreneurship include the non-formal banking sector, which is structured to accommodate the needs of the poor who are not able to provide the necessary and cumbersome paperwork required by mainstream bankers to access finance, and also have repayment methods structured according to their income frequencies; the pay-per-use services can provide essential services and products to the poor who cannot afford to own them. The system allows the poor to access the products, services, or equipment when required and pay a nominal fee to access the benefits when required. This allows users to access essential benefits that they need but could not otherwise afford, as they did not possess the means and capital to provide those benefits. An example cited by Shukla (2020) is the provision of toilet services. Access to a clean toilet, when required, is a basic need, but most people in India cannot afford to own one, as the toilets are expensive to buy. A company pioneered the idea of a mobile pay-per-use toilet that charges a nominal fee mainly for its operational costs; many other organisations based on social entrepreneurship approaches are discussed in Shukla (2020).

Women in Social Entrepreneurship

Statistics South Africa designates women as part of the marginalised groups of society, together with people living with disabilities, children, and people of colour (Statistics South Africa, 2010). Part of the purpose of social entrepreneurship is to empower the socially or economically marginalised. Agarwal et al. (2020) conducted a study to examine how the interests of women can be addressed and how women can be empowered through social entrepreneurship. Their angle of argument is that social enterprises have the power to empower women by providing equal opportunities through the skills and abilities required to succeed as entrepreneurs. The study relied on the resource-based theory, which holds that the success of an enterprise depends on how it maintains its competitive advantage by capitalising on its

external factors that are shaped by social and environmental forces. However, in the case of women led enterprises, due to the inequality that exists between men and women, additional factors within the personal, social, and environmental paradigm come into play. The study assessed women's attitudes to understand the psychological dimension of women as they traverse the social entrepreneurship journey, and to understand the change factors that influence their success. Data was gathered through interviews. Non-statistical analysis and deductive methods were used to analyse the data.

The study took into consideration other previous studies that investigated factors that affected women entrepreneurs, which found that social structures of family, friends, peers, colleagues, and relatives had a greater influence on women's entrepreneurship. In line with the previous studies, Agarwal et al. (2020) found that women social entrepreneurs are constrained by several factors that disadvantage them more than men. The study proposes that policies and programmes such as training, mentoring, and providing platforms for associations could be useful in improving the success of women as social entrepreneurs.

Women are far better at addressing social issues than men due to their femininity of compassion and empathy, which makes them more suited to employ inclusivity in social entrepreneurship (Rosca et al., 2020). The sociocultural settings of emerging economies, coupled with the scarcity of skills, extreme poverty, and high levels of masculinity, present a more constraining environment for women to thrive in society in general and for them to succeed as social entrepreneurs (Rosca et al., 2020).

The study by Rosca et al. (2020) followed the social entrepreneurial journey of women in developing economies as they navigate through the challenges posed by these hostile environments. Previous studies showed that women are largely pushed by difficult working conditions and unfavourable family conditions to engage in social entrepreneurship. In this study, it was found that personal circumstances and personal experiences played a role in the

choice of issues to address by the women social entrepreneur. The women survey showed more compassion on issues they had direct personal experiences on. It was also found that women found it hard to scale up and create supportive relationships where there was a need to overcome sociocultural barriers in socially deprived environments. The study proposed that with stronger government support, women social entrepreneurs can grow and make a more meaningful impact in dealing with social issues than their male counterparts. Women social entrepreneurs have the potential to assist other women break through the proverbial glass ceiling; as such, the role of women in social entrepreneurship should receive special attention, while social entrepreneurs should engage in specific efforts to address challenges faced by women.

Social Entrepreneurship Research Methodologies and Approaches

Conducting a thorough literature review is essential for the quality of research as it helps the researcher to relate his/her research to previous knowledge (Snyder, 2019), and also to have a sense of the approaches used by other researchers in a similar field to assess the best approach suited for the specific research. It is crucial to understand which methodologies and approaches work best in the type of research that one undertakes. Conducting research is a way of systematically and scientifically searching for the truth or finding a solution to problems or issues that need to be resolved; as such, the research methodology will represent the vehicle through which the systematic search for the truth is conducted (Patel & Patel, 2019).

A review of the literature within the domain of social entrepreneurship research shows a strong bias towards qualitative methods; quantitative and mixed methods have been used but less frequently. The bibliometric analysis conducted by Yesmin et al. (2021) found that 59% of the sampled empirical studies published between 1996 and 2019 adopted a qualitative approach, while only 36% and 5% of studies employed quantitative and mixed methods, respectively. A similar analysis conducted by Gupta et al. (2020), although covering

publications spanning a shorter period, between 2007 and 2018, found almost similar trends, with the qualitative methodology being the most frequently used.

One of the studies that used quantitative methods was conducted by Sonmezoglu (2022). It sought to determine the correlation between individual social responsibility and social entrepreneurship orientations. This investigation was conducted within a university setting where the individual social responsibility of students was measured against a scale ranking certain characteristics that define social responsibility. Another scale was used to measure the social entrepreneurship characteristics of the students. It would have been more appropriate to use a quantitative approach in this study, as the aim was to determine a correlation between two variables using statistical methods (Bloomfield & Fisher, 2019). However, the majority of social entrepreneurship research seeks to establish how the practice intervenes in social issues; this approach would require interpretive techniques that are largely associated with a qualitative methodological design (Bhattacherjee, 2012). While numerous studies employ longitudinal or exploratory ethnographic designs, one study by Bhatt et al. (2019) was notably found to have used a Q-methodology approach infused within a case study setting. This would have been a novel approach, as methodological plurality has thus far been a rare occurrence within social entrepreneurship literature. Suffice it to say that Mercader (2017) was observed to have employed methodological plurality, wherein a mixture of qualitative and quantitative methods was used, even though there is no clarity as to the need for a mixed methods approach in this study.

Be that as it may, the literature surveyed showed that social entrepreneurship research is not restricted to a single methodological approach, but it is open to the use of different methods and even a mixture of methodologies in a single study. This study will therefore build on the approach used by Bhatt et al. (2019) where qualitative methods will be used to establish the shared meaning of value within the context of the Karoo to concretise the construct into a

measurable quantity. Quantitative approaches will then be employed to quantify the identified value and also test its sustainability in a social enterprise environment. The SKA project will be used to test the effectiveness of social entrepreneurship activities in mediating sustainable value in the area.

Societal Issues Impacting Social Entrepreneurship Research

The "social" in social entrepreneurship suggests an entrepreneurship process with a social focus. Saebi et al. (2019) explain that any entrepreneurial activity inadvertently occurs within a social setting, since the market-oriented economic activities of entrepreneurship happen within societies and their social settings. However, there is a marked distinction between profit-oriented entrepreneurial activities and social entrepreneurship. Entrepreneurs employ innovation within an organisational context to address social needs (Salim Saji & Ellingstad, 2016), however, the motivation for acting is profit and economic value. Filion (2021) identifies innovation, opportunity recognition, risk management, action, use of resources, and added value as key tenets of entrepreneurship. Social entrepreneurship combines the same characteristics defining an entrepreneur with the sole intention of creating social value rather than economic value. In an attempt to define a social entrepreneur, Srivastava (2020) uses phrases that suggest that a strong presence of a social spirit, humanism, a desire to overcome social problems, and creating better communities are the driving forces for social entrepreneurship.

The common thread that emerges in the search for the difference between social entrepreneurship and economic entrepreneurship is the social orientation of the entrepreneurship activities. Society is a complex structure, and as such, implementing activities to deal with societal issues will inevitably pose several challenges. Several challenges are because social entrepreneurship as a practice is a fairly new concept, and most societies may not be institutionally aligned to accommodate the practice. Bhatt et al. (2019) found that in the

Chinese context, social entrepreneurship was constrained by the institutional environment. The Chinese social environment is quite rigid and highly regulated, and this makes it hard for public-initiated activities to permeate into society. The government is seen as the custodian of and main responsibility for social services and carries the mandate to intervene in social issues. It would be difficult for society to accept initiatives by private individuals aimed at intervening in areas where the government should traditionally do so. Social entrepreneurship is more likely to face widespread scepticism in such societies.

Hakami (2021) found that even within the unsupportive government regulatory environment in Saudi Arabia, Social Entrepreneurship is thriving and is an integral part of the Saudi society. The Islamic culture of giving to the poor was found to be a major factor in the success of entrepreneurship in community development, and the implementation of social entrepreneurship activities helps to promote and strengthen the culture of giving. However, major issues identified include the lack of a supportive legislative environment. Current government regulations in Saudi Arabia make it difficult for Social Entrepreneurship endeavours to be registered and legally recognised, which in turn puts them under threat as they do not comply with prevailing government regulations.

Another key issue identified in the literature that constrains the implementation of social entrepreneurship is the fact that social entrepreneurship is not profit-focused. Mainstream sociocultural values dictate that entrepreneurial activities should yield profits. Bhatt et al. (2019) found that social entrepreneurs often faced scepticism and a lack of societal acceptance of their initiatives due to a lack of trust in initiatives that are implemented in the name of social value rather than profit. This is partly due to the materialist values of society and partly due to a lack of awareness of these initiatives, as found by Polovko (2022). Compounding this difficulty is the fact that a lack of awareness leads to difficulty in securing resources for the implementation of social entrepreneurship initiatives. Mainstream funders may be reluctant to

fund initiatives that are unlikely to realise pecuniary returns on investment (Hakami, 2021). The conundrum of social entrepreneurship funding has been highlighted by Soegiono et al. (2019), highlighting the fact that relying on external funding might be detrimental to social entrepreneurship as it will drive social entrepreneurship activities towards profit-making rather than focusing on the creation of social value. Chandra et al. (2021) suggest that social entrepreneurs should be driven by a strong sense of entrepreneurial passion, the search for meaning in life, and the desire to serve the public; these characteristics limit pecuniary interests in entrepreneurship, thereby increasing the chances of success even in cases where external funding or non-funding of social entrepreneurship activities prevail. Sonmezoglu (2022) took it a bit further to suggest that these kinds of personal characteristics that increase one's propensity to engage in social entrepreneurship could be inculcated through participation in social activities that increase one's sense of social responsibility and community involvement such as participating in sporting activities. Another angle proposed by Sonmezoglu (2022) and also earlier hinted at by Lekhanya (2015) and later found by Erden and Erden (2020) is that of developing social entrepreneurship characteristics within a professional academic environment, such as universities and teacher training colleges. The researchers suggest that including social entrepreneurship-related courses in the curriculum of these institutions could increase the graduates' sense of social responsibility and community involvement, thereby positioning them to enter the social entrepreneurship space for the benefit of society rather than for their financial benefit.

The literature in this section makes it clear that several societal factors come into the space of social entrepreneurship. An approach that raises awareness of these factors and implements measures to counter the negative effects should be taken.

Contextualising Social Entrepreneurship

The preceding theoretical discussion makes a strong case for the utilisation of the social

entrepreneurship approach as a vehicle for the formulation of social value in society. However, the lack of a clear definition or description of what social entrepreneurship looks like remains the Achilles' heel in the adoption and utilisation of the approach. The proposal that this thesis makes is that the implementation of Big Science initiatives should incorporate humanism and social entrepreneurship in their community development efforts to achieve sustainable social development. What then would be the structure of social entrepreneurship within a Big Science initiative setup? This subsection will proceed to make proposals in this regard.

The Nature of Social Entrepreneurship. The nature of Social Entrepreneurship can best be explained through the lens of the social capital theory. Chen and Shabbir (2025) identified social relations, trust, and cooperation as key resources in the social capital network; these factors are key in assisting a network of social entrepreneurs to thrive. Yoon et al. (2015) mentioned similar factors as identified by Chen and Shabbir (2025) and argued that these factors of social capital facilitate coordinated action within a social entrepreneurship environment. Somwethee et al. (2025) observed some communities in Thailand that build social capital around knowledge sharing and curation of intellectual capital to build thriving social enterprises that help to create jobs and alleviate poverty in these rural communities.

Pierre Bourdieu's theory of social capital sees social capital as the total of accumulated social resources that each actor brings to the table within an acquaintance network to maximise social profit (Tzanakis, 2013). In Bourdieu's theory, profit may not necessarily be economic as such, but it should ultimately be translatable to economic capital; as such, the power dynamics within the acquaintance network determine the value each actor derives from the network activities by participation in the network (Tzanakis, 2013). The heavy reliance on economic output as the ultimate objective of social capital makes Bourdieu's approach to the theory of social capital a little problematic, as it places social capital as a tool to perpetuate inequality in society. One of the rules underpinning engagements within a Bourdieuan social capital

structure is that what you bring in is what you get out, thereby putting those who possess stronger social resources will leverage stronger social or economic profit.

James Coleman offers a rather refreshing view of social capital. Both Bourdieu and Coleman see social capital as a product of interactions within a social network; however, according to Tzanakis (2013) Coleman's view differs from that of Bourdieu in that he sees social capital as the glue that brings individuals and communities together. Unlike Bourdieu, who sees social capital as a tool to perpetuate class differences and social hierarchy, Coleman sees social capital as a resource that should mutually benefit all actors within a network.

A third view of social capital is that of Putman. Putman reconciles Bourdieu's view of social capital as a tool to perpetuate class struggles, thereby focusing on individual benefit, and Coleman's approach of placing social capital within interpersonal benefit and societal coherence, benefiting the broader community and organisational level by putting social capital as a tool for gain in broader civil structures (Tzanakis, 2013). Putman's theory positions social capital as central to societal good, healthy political culture, such as the culture of democracy, for instance, and social cohesion across societies. The common thread that binds the three theories together is that individuals, groups or organisations, and societies can achieve higher collective success through social networks and interactions. Bourdieu encourages individuals to thrive within the collective, while Putman encourages the use of individual successes to contribute collectively to the success of the group and Putman takes it further to the success of larger societies.

These theories of social capital offer a wider platform through which the nature of social entrepreneurship can be viewed. It has been established that social entrepreneurship is about coming together to tackle social problems. From a social capital theory perspective, social entrepreneurship becomes the leverage of social capital to tackle social problems and achieve collective success at the individual, group, and society-wide levels.

Social Entrepreneurship in the Context of Big Science. The Bourdieuian theory of social capital includes economic value as the definitive outcome of social capital, while Coleman and Putman do not necessarily place economic profit at the centre of social interactions but focus on social good as the outcome. This suggests that social capital for social entrepreneurship may not always translate into economic output. Still, the greater good for individuals, communities, and society at large may be an acceptable outcome or goal of a social entrepreneurship interaction. This then comes back to the questions posed by Morris et al. (2021) as to the elements that constitute social entrepreneurship. In answering the question of the composition of social entrepreneurship, the elements of social entrepreneurship outlined in Morris et al. (2021) will be dealt with systematically.

The approach taken by Morris et al. (2021) to describe social entrepreneurship by clarifying what it is not supposed to be is very valuable, as it does not attempt to confine the definition of social entrepreneurship to a single category that fails to provide a correct and accurate picture. Instead, clarifying what it is not will help identify activities that fall outside the scope of this practice.

The exclusionary categories representing what is not social entrepreneurship are (a) corporate social responsibility, (b) nonprofit management, (c) charity, and (d) social innovation. Anything conceptualised for a purpose fitting these categories cannot be classified as social entrepreneurship, even though principles of social entrepreneurship may be incorporated into the design and implementation of activities aligned with any of these categories. What designates a social entrepreneurship endeavour is the original intention and purpose rather than the outcome. Large corporations, including Big Science initiatives, engage in corporate social investment as a strategic or legal obligation (ElAfy et al., 2020) and a form of investment that may be expected to yield certain returns for the company - it should be understood that we are not making a case as to whether CSI is linked to corporate profits or

not, given that some scholars, for example Sekhon and Kathuria (2020) still believe that such an argument cannot be conclusively made at the moment – but the intention is to merely state the possible intentions behind the practice; as such, the intention upon which the endeavour is initiated does not qualify it to be classified as social entrepreneurship.

It then becomes prudent to explore what the structure of social entrepreneurship in a Big Science project would look like, what the social component looks like, and what form and shape the entrepreneurship will take. Again, we will turn to Morris et al. (2021) to seek insights into how the Big Science initiative can structure itself to achieve the objectives of a social entrepreneurship endeavour. The main existential imperative of a social entrepreneurship undertaking is to create social value. Social entrepreneurship scholars may not agree on its definition, but the literature in this field agrees that the defining feature of social entrepreneurship is that it has the main objective of addressing a social problem. Intervening to solve social problems within the locality of operations of a Big Science initiative is a plausible choice, as such, there is room for these initiatives to take the first step toward following a social entrepreneurship model.

The second element of entrepreneurship identified by Morris et al. (2021) is that of innovation. Morris et al. (2021) propose that solutions offered through social entrepreneurship should be novel in such a way that they improve the lives of those in society. The question to ask hereon is whether a Big Science initiative is structured to innovate within a social intervention paradigm, thereby effectively begging the question, what is innovation? Blok (2021) offers a philosophical consideration of the concept of innovation, dispelling the rigid notion of innovation from the techno-economic view. According to this view, innovation should involve some new technology that gains commercial value. Of course, this notion is exclusionary as innovation still happens outside technological inventions and commercialisation, hence, Trott (1999) describes innovation as ideas that are transformed into

a new product, a service, or a process that creates value. Noting that Coleman's theory of social capital accepts that value created within a collaborative environment may result in other forms of value that are not economic, it can then be assumed that innovation may result in other forms of value other than commercial value, such as social value, which is the primary focus of social entrepreneurship. In its quest to address social problems and create value in society, there is room for a Big Science initiative to be innovative.

Thirdly, Morris et al. (2021) address the question of process. What processes constitute social entrepreneurship? Combining ideas from various scholars, they identified the process of engaging in social entrepreneurship as consisting of identifying gaps and opportunities in society, social value proposition, establishing a purpose vehicle with a mission, mobilisation of resources, stakeholder engagement, undertaking activities to deliver social value, and scaling of social impact through collective action. This thesis proposes that the process of reflection, monitoring, evaluation, and providing feedback to stakeholders as part of the social entrepreneurship process can add value to the process, as it is crucial for the successful scaling of the social impact and can also address and support continuous innovation.

Once the elements of social entrepreneurship have been taken care of, two critical questions need to be asked. Firstly, there is a need to ask who can do social entrepreneurship. In this context, the specific concern would be whether a Big Science initiative can involve itself in social entrepreneurship or not. Not an easy question to answer since there are no clear criteria and sets of rules that determine who can do social entrepreneurship. Examples of individual entrepreneurs, small and large organisations, community groups, non-profits, and various forms of formations have emerged within the social entrepreneurship space. Morris et al. (2021) suggest that even government entities can do social entrepreneurship. No underlying restriction could be found in literature that limits social entrepreneurship either in structural or practical terms, as such, nothing restricts a Big Science initiative from engaging in social

entrepreneurship. The second pertinent question is how a Big Science initiative embraces the "entrepreneurship" aspect of social entrepreneurship? Traditional entrepreneurship is understood to generate revenue and profits. Although in social entrepreneurship, revenue and profits are not the main driving force, they are still required to sustain the initiative. In the case of a Big Science initiative, there will be multiple ways of generating profits. It was earlier suggested that one of the processes required to engage in social entrepreneurship would be to set up a special purpose vehicle, this component of the Big Science initiative should be set up in such a way that it will have the capacity to generate revenue and profits. However, the bigger profit in this regard will be the social value generated, as it was discussed earlier that profits within a social network engagement may not necessarily be commercial but can be other societal aspects that contribute to social value.

Concept Alignment: Social Entrepreneurship in Relation to the Social Enterprise

Although there are nuanced overlaps between social entrepreneurship and social enterprise, there are distinct conceptual and practical boundaries between them, and this is a subject of debate in academic literature (Kurata et al., 3023; Saebi et al., 2019).

Relying on the authorities of scholars such as Dees (2018), Saebi et al. (2019), Kurata et al., (2023) and many others on the description of Social Entrepreneurship, it could be understood that it is more of a philosophical mindset with a focus on resolving social or environmental problems. The driving force behind the social entrepreneurship mindset is innovation, recognising opportunities, and the mobilisation of resources. One of those resources is the social capital that exists within a community framework, which is used to create social value. It disrupts traditional methods and approaches to addressing social problems, creating scalable solutions. The Social Entrepreneurship mindset is not concerned with profits; hence, the vehicle through which the social value is attained may not necessarily be a Social Enterprise. As such, social entrepreneurship can occur within or outside formal organisations

and may not always result in a social enterprise. For instance, it includes advocacy, policy influence, or grassroots movements.

A Social Enterprise, on the other hand, is an entity or an organisation that operates with a social or environmental mission as its primary objective. The Social Enterprise pursues commercial activities with social goals. Although the Social Enterprise prioritises social impact over profit, its primary focus is on financial sustainability.

Petrella and Richez-Battesti (2014) call for the diligent use of these concepts to avoid conceptual ambiguity. They argue that the choice of terms is not neutral and reflects different theoretical perspectives.

The theoretical and conceptual framework underpinning this thesis is anchored in this perspective of Social Entrepreneurship as a philosophy operating outside a Social Enterprise.

Social Entrepreneurship-based Socioeconomic Sustainability

The foregoing section established that social entrepreneurship deals with social returns as opposed to that which deals with economic returns. Further to that, it was established that sustainability within the context of the Big Science enterprise should be seen through the lens of socioeconomic sustainability. The intersection of humanism and social entrepreneurship provides fertile grounds for the attainment of socioeconomic sustainability.

Socioeconomic sustainability, like other dimensions of sustainability, means achieving collective and lasting economic welfare without depleting the ability of future generations to achieve the same (Baffoe & Mutisya, 2015). Of course, the integrated approach to sustainability means that in the quest for socioeconomic sustainability, environmental sustainability cannot be pushed to the periphery. The pursuit of socioeconomic sustainability that is rooted in equity, social cohesion and trust, which collectively strengthen community resilience and improve the quality of life (Larimian & Sadeghi, 2021), will be truly sustainable and meaningful if it preserves the very environment which supports its growth. The challenge,

however, as identified by several sustainability scholars including Baffoe and Mutisya (2015) and Larimian and Sadeghi (2021), is that, unlike environmental sustainability, socioeconomic sustainability is hard to quantify as its elements are complex and difficult to operationalise. The operational breakthrough in this regard lies within the intersection of humanism and social entrepreneurship. As such, this thesis will not attempt to quantify sustainability; it will rather infer its plausible presence by looking at the contextual interplay in the humanistic-social entrepreneurship environment.

Summary

This section kicked off with a discussion of the historical perspective of the concept of humanism. It establishes that humanism is as old as human beings; however, it began to emerge as part of mainstream discourse in the mid-twentieth century, drawing on the classical Renaissance humanist tradition. The development trajectory of humanism was met with fierce resistance along the way, with detractors labelling it as a form of elitism and an attempt at human exceptionalism. Humanism has, today, found its way into mainstream management theory. The discussions in this section point to the fact that humanism, in management, is more of a management philosophy rather than a management style, which puts the maximisation of profits aside and concerns itself solely with the human factor. A case is made for Big Science initiatives to incorporate humanism in their management approaches if they are to realise social impact.

The concept of social entrepreneurship was also discussed in this section. Social entrepreneurship is framed as an approach whereby society comes together as a collective to tackle its social problems. Social entrepreneurship is a philosophy that informs the business model adopted to address issues of social value; however, its intention is not to achieve economic value but to achieve social value. It is proposed that a social entrepreneurship

philosophical approach that is grounded within the principles of humanism stands a much bigger chance of assisting Big Science initiatives to achieve sustainable value while driving impact within their localities.

Key Constructs and Variables

The meaning of descriptive terms can be identified through referential competence (Noble et al., 2022) when the identifier possesses structural clarity of meaning. For example, a dog is identifiable by its common shape, but also by the fact that it can bark. However, abstract concepts may not possess inferential classification, as such conceptual clarity requires a lexical framework of meaning to create a common understanding.

However, the concept of social values cannot be subjected to a similar categorisation. One can infer its meaning when used in a particular context but can also assume a different identity in a completely different context. In the context of a developed first-world society, social value might be inferred to mean living standards of opulence, while in a poor rural community, the concept of social value might be associated with living standards within or barely above the poverty line. Having a roof over one's head, having something to eat before going to bed, or having a cup of clean water to drink might be considered social value in extremely poor communities. It is therefore important to develop a clear lexical framework to achieve conceptual isomorphy of the concept of social value. This section will delve further into the literature on Social Entrepreneurship research to search for the possible meaning of the concepts and constructs applicable to this research. This will aid in developing taxonomies of measurement for these concepts.

Social Value

A common thread across social entrepreneurship literature is the concept of social value. The principal aim of social entrepreneurship is to create social value. It is also the aim of this research to test how a Big Science initiative like the SKA project can use social

entrepreneurship combined with humanism to create social value in the rural Karoo region. It is therefore necessary to unpack this concept of social value to achieve a common understanding of the meaning and characteristics of the concept. A clear definition of social value and a clear delineation of its characteristics will enable and facilitate the process of systematically identifying and measuring the existence of social value in the specific community.

A society is a complex environment that consists of multiple facets of interconnected parts; the people and their social interactions, the culture, norms, and values, the environment and resources, economic conditions, and all other aspects, tangible and non-tangible – these components come together to constitute a society. The nature of these elements differs across various societies. Norms and values in Japanese society will be completely different from norms and customs in an African society, for instance. Japanese societies value the principles of Garman and Kaizen, while African societies value Ubuntu. Inevitably, these two societies will be structured differently. Even within commonly cultured societies, there will be distinct nuances that mark significant differences between societies that necessitate different structures of society. In South Africa, for instance, due to the high levels of crime in urban areas, people tend to build high walls around their yards. This approach creates a distance between neighbours such that people go on with their lives without worrying about the well-being of their neighbours to the extent that most people don't even greet each other when they meet on the streets. But the picture is completely different in the rural areas where neighbours treat each other like family and still share meals. If societies are structured differently, then the nature of social value will also differ across different societies. Social value, therefore, becomes a multipolar construct, determined by the norms, values, needs, and structure of society.

From a resource-based paradigm, Di Domenico et al. (2010) provides a clue as to what might constitute social value:

> "to create social value, there is an endemic need for dynamic resource creation as a necessary tactical response to the pressure of resource scarcity. This is achieved by altering existing arrangements where the need arises, and improvising and adapting rather than remaining rigidly resolute to predetermined plans or formulae" (p.690).

This viewpoint on the resource-based nature of social value relies on adaptive and innovative ways to ensure the constant supply of resources to meet the needs of society. From the Bourdieuan social capital theory point of view, the nature of resources brought into the social value creation social network will determine the nature of the social value that develops in the society. Societies that bring value-based resources will realise value-based social value, and societies that prioritise pecuniary resources will realise commercial-based social value.

Vázquez-Maguirre (2020) approaches the concept of social value from a holistic paradigm that incorporates multiple facets but has the well-being of the community as its central pillar. Community well-being, in Vázquez-Maguirre's view, is a function of good health, decent work, low levels of inequality, and economic and environmental sustainability – these factors come together to enhance a dignity-oriented social economy that impacts positively on the prosperity of all stakeholders. Social value becomes a collective virtue that binds society together and generates greater positive impacts for the well-being and flourishing of everyone. Vázquez-Maguirre's view is more aligned with Coleman's and Putman's views of social capital as opposed to the view taken by Di Domenico et al. (2010) of looking at social value from a resource perspective, more aligned with Bourdieu. Vázquez-Maguirre's view takes an integrated and balanced approach that seeks to embrace all aspects of human flourishing.

Sultan et al. (2018) have taken a view of social value completely different from that of Vázquez-Maguirre, Di Domenico and others. Sultan and others contrast social value with poverty, arguing that social entrepreneurship creates social value by eradicating poverty. Accordingly, they define poverty as the lack of access to basic human needs. Human beings require adequate nutrition, access to clean water, access to shelter, health services, education,

and access to means of generating income that enable them to sustain their livelihoods. At the bare minimum, this is what human beings require to survive and continue to live. However, Jolliffe and Beer Prydz (2017) indicate that the level and quantum at which these human needs are to be met to escape poverty depend on the social configuration of specific societies. The measure of the bare minimum human needs may increase as a community becomes richer or decrease significantly as the community becomes poorer. To illustrate this point, we use the concept of security in a specific community. In communities that are extremely poor, security might mean protection against natural harm, such as harsh weather conditions, heavy rains, disease outbreaks, and similar occurrences. In more economically advanced societies, security might mean protection against man-made threats, which would require investing in certain artificial security measures for personal protection. In certain societies, a basic need might be the ability to afford a vehicle as a basic security and convenience need, while in an economically depressed society, the ability to afford shoes may be their basic need so that they have the comfort of walking on shoes when going to work.

In the view of Sultan et al. (2018), social value means ensuring that people have access to basic needs equivalent to the standards of their respective societies. This view is in line with the trends that emerged earlier in the review of the literature to understand the regional concentration of Social Entrepreneurship. It emerged earlier that the US and UK are high on social entrepreneurship activities, and it was also established that social entrepreneurship activities are more generally prevalent in developed countries than in poorer countries due to issues such as the availability of funding and government support (Soegiono et al., 2019), social value is not only applicable to poor rural communities but to all communities as societies need to maintain their living standards and sustain their wellbeing by ensuring that basic human needs at their standards and levels are adequately provided for. Social entrepreneurship is more desirable in poor rural communities as it has the power to take communities out of poverty, but

the social value philosophy posits that any community, irrespective of its level of affluence, or the lack thereof, still require the integration of social entrepreneurship to sustain its state of social value.

Perhaps the lack of a single and unifying definition of social entrepreneurship, which is dealt with at length by Morris et al. (2021), is closely related to the diverse nature of social value. Given that the main purpose of social entrepreneurship is to solve a social problem and develop social value, and that social value is context specific, it would follow that the nature of social entrepreneurship required to bring about social value would also be diverse and context specific. Pinning social entrepreneurship into a single theoretical classification would restrict the creativity and innovation required to tackle different social problems that exist in different societies, thereby streamlining social value that may not be relevant to the context being dealt with. The lack of a definition for social entrepreneurship is therefore a strength for its application rather than a shortcoming. However, the strength and success of a social entrepreneurship initiative should lie in its purpose, the innovative approaches that enable the initiative to provide relevant and impactful social value, as well as the design of the processes followed in achieving the social value.

The approach taken by Vázquez-Maguirre (2020) is quite useful in quantifying social value as it incorporates measurable variables that can be scaled to explain the level of social value existing within a specific community. The nature of social value based on Vázquez-Maguirre's approach will be unpacked later in this section.

Stakeholder Engagement and Consultation

Stakeholder engagement is a concept applicable to any organisational environment that involves human interaction, be it the health sector, policy development, education, or public engagement (Sachs & Kujala, 2020). However, as it will become clearer later, the aim, methods, approaches, and forms of engagement depend on or are influenced by the intended

outcomes. In organisational management, stakeholder engagement can have an impact on organisational activities such as the creation of value, knowledge co-production, organisational learning and growth, and innovation and entrepreneurship (Sachs & Kujala, 2020).

Stakeholder engagement is a process that an organisation can engage in to involve its stakeholders in the affairs of the organisation for the mutual benefit of both the stakeholders and the organisation. Such a process can include the sharing of information, consultations, engaging in dialogue, and joint decision-making processes (Grama-Vigouroux et al., 2020). Such engagements have the potential to enhance value creation for the organisation (Gupta et al., 2020). Within a social entrepreneurship paradigm, stakeholder engagement can enhance the creation of social value. Grama-Vigouroux et al. (2020) looked into factors that foster a firm's collaboration with its stakeholders to create value and found that firms that engage in a coherent open innovation system, where stakeholder contribution is integrated into the organisation's innovation system, tend to realise higher value. These findings have profound implications for social entrepreneurship as the open innovation system provides a framework for stakeholder engagement within social entrepreneurship activities to realise social value.

Moreover, the theory of social capital plays a prominent role in shaping the ontological orientation of social entrepreneurship, which is based on the collaboration of stakeholders in pooling together the necessary social resources for the attainment of social value. Interactions among stakeholders whose interest is to build social value undeniably become the cornerstone of social entrepreneurship. The key requirements of humanism as espoused by Matheson et al. (2021) include a focus on human flourishing, well-being, dignity and respect. Interactions within a humanistic environment should recognise people's rights, be caring, and protect other people's interests. Combining humanistic approaches and the demands of social entrepreneurship calls for a special form of stakeholder engagement that has a deeper meaning than casual interactions within the organisational environment. Stakeholder engagement is thus

a prominent feature of value-building initiatives. Open innovation, as explicated by Grama-Vigouroux et al. (2020) is a form of social innovation within a social entrepreneurship paradigm, which, according to McNally et al. (2020), is high on humanistic and social commitments. Open and honest engagement, within the guiding principles of humanism, which are high on

Stakeholder engagement that creates value should be based on joint interests, the ability to collaborate, and trust in stakeholder relations. Sachs and Kujala (2020) indicate that stakeholder engagement can assist an organisation in making the right decisions that favour their stakeholders, thereby minimising conflict, improving relations, and enhancing the societal and environmental standing of the organisation, which are the ingredients of an open innovation system that creates higher value (Grama-Vigouroux et al., 2020).

From a humanistic perspective, stakeholder engagement can serve to affirm the dignity of the stakeholders, which is the central focus of humanistic management, as it honours their status as legitimate participants in the social entrepreneurship process by opening up avenues for knowledge sharing and common purpose (Etinson, 2020). The success of social value creation within a social entrepreneurship environment would be highly dependent on how stakeholders are engaged.

Ethics and Integrity

The literature on social entrepreneurship and humanistic management has already shown the strong link between human dignity, sensitivity to stakeholder needs, and sociocultural and environmental considerations; all of these factors are encompassed within a humanistic approach to dealing with social issues. The Vázquez-Parra et al. (2022) study brings in the aspect of ethical behaviour and integrity as a necessary element of social entrepreneurship and humanistic management. The study showed that ethics training within a professional training

environment increases social entrepreneurship competencies, thereby highlighting the importance of integrating ethics into social entrepreneurship.

Bruder (2021) argues that social entrepreneurship is a special form of entrepreneurship, completely different from other forms of entrepreneurial activities due to its normative orientation. Dr Bruder argues that approaching social entrepreneurship as a social mission has the potential to cause more social harm than good. The mission-oriented social entrepreneurship approach seeks to achieve a specific social mission, for instance, eradicating poverty by implementing job creation initiatives. The focus on a mission to eliminate poverty could be achieved through innovative initiatives within the social enterprises. However, if the normative approach of social entrepreneurship is not emphasised, for instance, an innovative idea that results in job creation but fails to consider the environmental effects of the initiative. It would be well and good to have achieved the social mission, but social value would not have been achieved since the moral and ethical consideration of environmental sustainability would be lacking. Dr Bruder argues that such social entrepreneurship does not result in social value as it is devoid of the normative ethical grounding that ensures all activities aligned with the process are beneficial and sustainable to the collective. From an ethical perspective, the primary focus of social entrepreneurship should be grounded in the normative conditions of legitimacy, which dictate humanistic and environmental considerations (Bruder, 2021).

The bibliometric analysis of published social entrepreneurship research conducted by Hota et al. (2020) found that the early work on social entrepreneurship did not include a discussion of ethics, probably because it was assumed that a social-focused initiative that has the sole aim of addressing social issues would be ethical by design. It would appear that early researchers did not see it as necessary to examine the role and effect of ethics in these initiatives, taking it for granted that socially oriented activities will be based on ethical motivations (Sengupta & Lehtimäki, 2022). However, this approach legitimises the mission

approach (Bruder, 2021) to social entrepreneurship, which is likely to result in the abuse of social entrepreneurship that completely ignores the ethics of care (Sengupta & Lehtimäki, 2022).

The mission approach in itself offers great opportunities for social entrepreneurs to focus on a specific mission and define a clear and focused path in dealing with a social problem. According to Beckmann et al. (2014), this approach is a key distinguishing factor between business-focused entrepreneurship and social entrepreneurship. The business approach is a profit-driven mission, while social entrepreneurship is motivated by the need to address a social problem. The mission driven social entrepreneurship allows the social entrepreneur to identify a social mission and design entrepreneurial activities that align with the mission (Beckmann et al., 2014). Decision-making within mission-driven social entrepreneurship is guided and driven by the imperatives of the mission and also offers opportunities to involve stakeholders who share the same values and foster innovative solutions (Wu et al., 2020). Nonetheless, Sengupta and Lehtimäki (2022) still feel that the fixation on a particular mission has the potential to create an all-or-nothing approach where the social entrepreneur is tempted to achieve the mission at all costs, thereby neglecting ethical considerations in the process.

Sengupta and Lehtimäki (2022) argue that ethics in social entrepreneurship is more than an individual characteristic but should be shaped by the relational context between the social entrepreneur and society. Social entrepreneurship within a relational context is shaped and driven by four-dimensional paradigms of ethics, as identified by Sengupta and Lehtimäki (2022). The social entrepreneur is driven by the ethics of deep care about and connection to society for collective gain, a sense of community engagement to identify the real pains of the community, giving care by initiating change and producing solutions that relate to the community, and the community caring back through trust and friendship. This ethical approach

to social entrepreneurship is what Bruder (2021) calls good social entrepreneurship as opposed to mission-driven social entrepreneurship.

Synergy in Humanism and Social Entrepreneurship

Humanism and social entrepreneurship emerge as preferred contemporary philosophies suited to address societal problems while emphasising the value of the human being. Humanism, on the one hand, emphasises the value and dignity of the human being and calls for business management and leadership approaches that focus on the individual and his/her dignity as opposed to the focus on profits and shareholder value, while social entrepreneurship, on the other hand, emphasises the creation of social value by attending to societal issues through the implementation of innovative and sustainable solutions.

Humanism and social entrepreneurship share common values as they both prioritise the well-being and thriving of individuals and societies. Both concepts recognised the importance of human agency and strived to foster conditions that enable individuals to reach their full potential. Social entrepreneurs can draw inspiration from humanist principles to inform their approach to the implementation of their activities, while humanists can use social entrepreneurship activities as a platform to implement and further their humanistic principles and approach, thereby collaboratively creating sustainable models that effectively address social challenges, creating social value while restoring, promoting and protecting human dignity.

The case of Professor Mohammed Yunis of the Grameen Bank, which used microfinancing as a means to uplift impoverished individuals, particularly women, and empower them to start their businesses and improve their economic well-being, has already been cited as one good real-world example demonstrating the synergetic relationship between humanism and social entrepreneurship. One notable case is the Grameen Bank, founded by

Nobel laureate Muhammad Yunus. Grameen Bank. Prof Yunis's approach skillfully combined social entrepreneurship methods with humanistic principles that recognised the inherent potential of individuals to make significant strides in solving the societal scourge of poverty.

Delineating Karoo-Based Social Value as a Latent Variable

Socioeconomic Value from the SKA Perspective

The South African Radio Astronomy Observatory (SARAO) is involved in a project to establish the largest and most powerful radio astronomy telescope in the Karoo in South Africa. Figure 1 shows the precursor to the SKA, called the MeerKAT, already been completed in the Karoo. The telescope is located in the Upper Karoo region of the Northern Cape in South Africa. The entirety of the telescope will span a distance of nearly 150 km in width and extend from its core, straddling the small towns of Carnarvon, Williston, Vanwyksvlei, and Brandvlei, within two district Municipalities, namely Namakwa District Municipality and Pixley ka Seme District Municipality. Figure 2 shows the area coverage of the instrument.

Figure 1

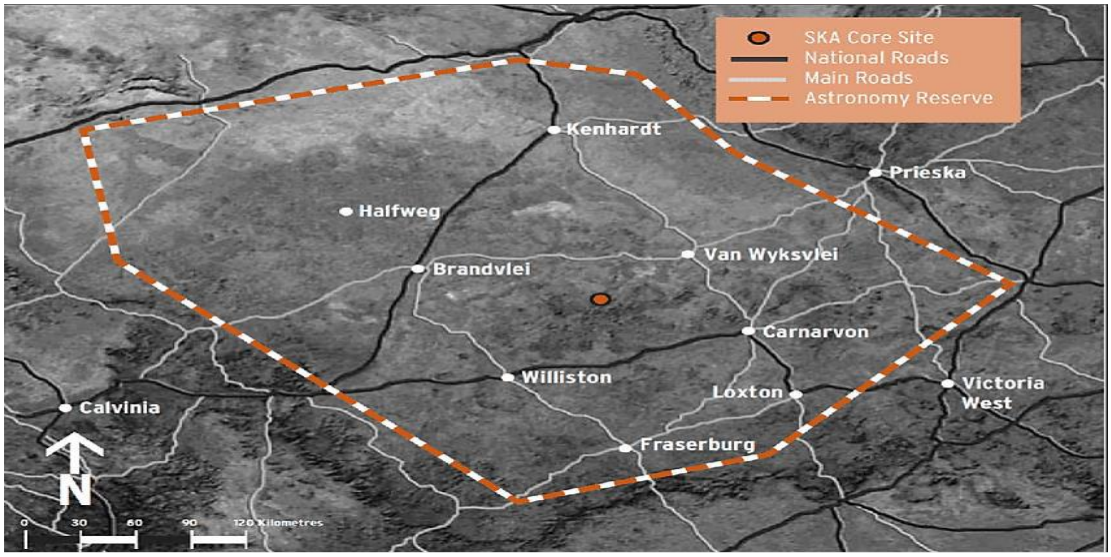
The MeerKAT Telescope in the Karoo



Note: From the SARAO website gallery (www.SARAO.ac.za)

Figure 2

Area Coverage of the SKA and Affected Towns



Note: from Cooper and Swart, 2023.

The Upper Karoo is generally a low-income activity region, relying mostly on sheep farming and related products. However, due to the long dry spells experienced in the semi-arid region, sheep farming is less reliable as the main economic livelihood. There are fewer job opportunities and a myriad of other social ills, such as substance abuse, youth unemployment, fetal alcohol syndrome, and high dependency on social grants, coupled with underdevelopment and lack of service delivery (Walker, 2019). The natural expectation from the community is that the implementation of a Big Science project such as the SKA will relieve their economic hardship and bring about development in the area. Several studies were conducted to determine the extent of development in the areas surrounding the SKA project, specifically, the four towns flanking the core site of the telescope, as depicted in Figure 2: Carnarvon, Williston, Brandvlei, and Vanwyksvlei.

According to Hickman (2008) it was predicted at the inception of the project that the implementation of the SKA project would bring about positive socioeconomic development in the Karoo and the country at large. Some of the predicted developments include job creation,

an increase in tourism in the area, and the availability of broadband infrastructure. Gastrow and Oppelt (2018) confirmed in 2018 that indeed there were some pockets of positive developments, even though they could not be quantified. Tiplady (2021) identified several projects that the SARAO is implementing to uplift the socioeconomic status of the areas. These development projects include a human capital development programme, local investment for job creation, commercialisation of technologies arising from innovations in the design and construction of the MeerKAT telescope, technology development, and regional development of astronomy research, but Basheer (2023) found that these initiatives are not aligned with the expectations and needs of the local people. This, again, echoes the issue of misalignment between what the implementers of the project believe to be socioeconomic development in contrast to what will impact the local community and change their dire situation.

The South African Radio Astronomy Observatory (SARAO) in 2023 commissioned an independent study to gauge the socioeconomic developments that have accrued since the start of the implementation of the project and also to evaluate their impact on the community. The study was conducted by an independent firm of economists on behalf of SARAO and the Department of Science and Innovation. The study was conducted over six months and established several positive aspects of development attributed to the SKA, both in the local communities and the country at large. The researchers established that SARAO is implementing the following programmes in the community: a Schools Support Programme, a Technical Skills Training Programme, a Farm Workers Programme, an SMME Development and Support Programme, a Community Development Grants Programme, a Creative Crafts Initiative, and a Science Open Days initiative (Cooper & Swart, 2023) – these programmes and initiatives are aimed at creating socioeconomic value for the communities in the focus areas. The study concluded that:

> "…it was determined that since the establishment of MeerKAT/SKA, the project has contributed substantially to socio-economic conditions in the focus areas including skills

> development, youth education, employment, average household income, SMME development, economic growth, and production, and increased property values" (Cooper & Swart, 2023, p.171).

It is these supposed positive developments that need to be tested against the value propositions of the communities to ascertain if indeed social value is derived.

Socioeconomic Value from the Community Perspective

It has been established earlier, through the review of literature, that social value is a multipolar construct that requires a negotiated framework of meaning and understanding. Different societies will have different understandings of what constitutes their social value. This could explain the findings of the study conducted by Basheer (2023) revealing that the people of Amandelboom, a township in Williston, which is one of the towns in close proximity to the SKA project and receiving socioeconomic intervention through SARAO led development programmes, felt that the socioeconomic programmes and initiatives implemented by SARAO as part of the SKA socioeconomic programme did not align with their needs; as such, as the community, they are not deriving any benefit from them. Basheer's findings fall squarely within the notion of a dichotomy between supposed development on the ground and the needs and expectations of the people. The implementers of the SKA have their own understanding of the socioeconomic value and initiated programmes within the community to achieve social value, while the community had different expectations altogether.

The literature reviewed thus far shows that social value can be achieved through humanistic management implemented within a social entrepreneurship environment. Backed by the theory of social capital, social entrepreneurship calls for relevant stakeholders to come together within a social network and share their social resources, guided by humanistic principles to achieve impactful and sustainable social value. Arising from the ontological classification of social entrepreneurship and the demands of humanism as a guiding management principle, several factors come to light as the theoretical determinants of social

value. These factors, as discussed below, have the potential to collectively constitute social value:

Observing the Worth of Human Beings: The essence of humanism is centred on restoring the agency of human existence and treating individuals as worthy human beings in their own right. The interface between humanism and social entrepreneurship allows for an organising approach that puts the value of the individual at the forefront as opposed to prioritising profits. Tackling a social problem requires that those who are directly affected by the problem are put at the forefront. It would be expected that the SARAO socioeconomic development initiatives implemented in the area of Carnarvon to ring bout social value are structured with the community and the people of Carnarvon in mind, and they are put in the forefront as worthy human beings. It is expected that an environment created within the socioeconomic initiatives of the SKA project that gives a sense of self-worth to the community will be prevalent.

Engaging Stakeholders: Society is viewed as an important stakeholder in negotiating the mission and priorities to be addressed within any social entrepreneurship approach. Community members should feel involved, and their views and aspirations should be considered and valued in any initiatives and implementations that seek to address societal issues that affect them. The theory of social capital sets the scene for a special type of stakeholder engagement that calls for the sharing of social resources among the actors in a network. The process of creating social value, thus, calls for genuine engagement among all stakeholders; the community should be engaged and fully involved in the process of creating their social value if it is to be impactful and scalable. through recognised and acceptable stakeholder engagement processes.

Dignified Approaches: Restoring and protecting the dignity of individuals is one of the central tenets of humanism. The entire formulation by Vázquez-Maguirre (2020) of a model

to build sustainable rural communities in Latin America through humanism is based on the restoration and upholding of human dignity. There can be no meaningful stakeholder engagement and observation of the worth of human beings without considering and safeguarding their dignity. The social entrepreneurship activities implemented in the community should be seen and accepted by the community as a means of restoring, upholding, respecting, and protecting the dignity of all community members.

Ethics. The interface between social entrepreneurship and humanism calls for ethics, integrity, and honesty in implementing social value-creating activities. The approach to implementing social entrepreneurship activities should be perceived as fair, ethical, and inclusive.

Protection of Vulnerable Groups and Inclusivity: Women, children, and any other groups identified as vulnerable in the community should feel included and given opportunities to fully participate as worthy stakeholders in the implementation of social entrepreneurship activities. South Africa, specifically, has a bitter history of institutionalised discrimination and exclusion based on race, ethnicity, and, recently, socioeconomic status. Any effort perceived to be exclusionary in any form or shape will not succeed in adding social value but will instead cause division and harm in society. The leadership approaches applied in the process should protect all vulnerable and marginalised groups and ensure that they benefit equitably.

The concept of inclusivity is a sensitive one in the South African context, given the previous painful history of systemic oppression and segregation under Apartheid. Under Apartheid, the natives who were classified as black according to the racial categorisation within the system were excluded from many privileges that were reserved for Whites. They were subjected to dehumanising laws which prevented them from accessing quality education, healthcare, essential services and their rights as human beings. Under the new dispensation, the country needs to move forward as one, with everybody getting equal opportunities. It is

therefore crucial that any engagement reflects the principles of inclusion and equal access and opportunities to all residents of the area.

Ubuntu: The approach and implementations should embrace the values of oneness as enshrined in the African philosophy of Ubuntu. Although the concept of Ubuntu does not directly arise from the theoretical formulations in the reviewed literature, it is an appropriate and relevant consideration to enhance the positive results of humanism in the African context.

Measurement Approach

The six factors developed in the preceding section, grounded in theory, constitute broad themes that collectively give rise to the Social Value in any given environment. The nature and detailed constituents of each theme are context-specific and can only be determined by the specific community to which it applies, based on its socioeconomic needs and priorities. Therefore, to measure the Social Value, one would need to first establish the specific contextual elements that give rise to each of the theory-based thematic categories, develop an appropriate measurement regime for such elements and, based on those measurements, make inferences about the Social Value in that specific context. Although the theory-driven elements are true for social value in any given social environment, identifying and measuring the specific underlying elements of social value in a specific environment will be a function of the contextual factors within that environment. A natural corollary of the above is that social value cannot be directly measurable but would be quantified through observing and measuring its underlying factors. As such, social value is considered a latent variable.

Literature describes a latent variable as a construct that cannot be directly observed; as such, it cannot be assigned direct measurement scores (Sarstedt et al., 2019). The latent construct is observed through other variables that can be assigned observable scores. The accuracy of latent variable measurement relies on the clarity of the measurement model and the relationships articulated in a theoretically constructed model that depicts the relationships

between the latent variables and their underlying factors, which are called indicators. Sarstedt et al. (2019) describe two fundamental approaches to measuring latent variables. The one approach positions the latent construct as the cause for the indicators; this is the reflective approach, while the other, described as the formative model, positions the indicators as the cause of the latent construct. In the case of social value, as described earlier, the theoretically determined categories become formative dimensions that give rise to the Social Value within that context. Since the six theory-based categories of social value are not directly measurable but manifest through a collection of context-specific indicators, they become first-order latent variables. In contrast, social value becomes a higher-order formative construct that is, in turn, determined by the six categories.

Various possible statistical models can be used when a latent variable is to be measured. The choice of a specific model depends on the goals and objectives of the analysis, whether it is exploration, measurement validation, or full causal modelling.

The Exploratory Factor Analysis (EFA) model is usually applied in the absence of a strong a priori theory about the underlying relationships among the factors under observation (Rafiuddin et al., 2025). It explores patterns and identifies underlying factors or dimensions that explain the interrelationships among a set of observed variables. By extracting factors, EFA provides insights into the dimensions that contribute to the latent variable and allows for the reduction of complex data into a smaller number of interpretable factors (Taherdoost et al., 2022).

A related, but distinct, approach is the Confirmatory Factor Analysis (CFA) model. This is a model-based system that tests a pre-specified factor structure. It aims to confirm the theoretical assumptions about the relationships between observed indicators and the latent variable. CFA is used when there is a well-defined theoretical framework, and researchers want to examine if the observed variables align with the expected factor structure. The hypothesised

relationships between the latent variable and observed indicators are specified. The model assesses the fit between the specified model and the observed data, providing information about the adequacy of the measurement model (Alavi et al., 2020).

Another statistical technique closely related to the two is Structural Equation Modelling (SEM). This technique is a comprehensive statistical approach that combines factor analysis and regression analysis to examine the relationships among latent variables and observed indicators. The SEM technique allows researchers to test complex theoretical models that incorporate components of both the measurement and the structural relationships between variables. It assesses the appropriateness of the overall model, examines the relationships between latent variables, and estimates the direct and indirect effects between variables. SEM is a powerful tool for testing hypotheses and evaluating complex theoretical frameworks (Gana & Broc, 2019).

Given that this Thesis has developed a clear a priori theory around the concept of "Social Value", what it means and how it breaks down into its six components, the Partial Least Squares Structural Equation Modelling (PLS-SEM) would be the most appropriate technique to test the appropriateness of the proposed theoretical model.

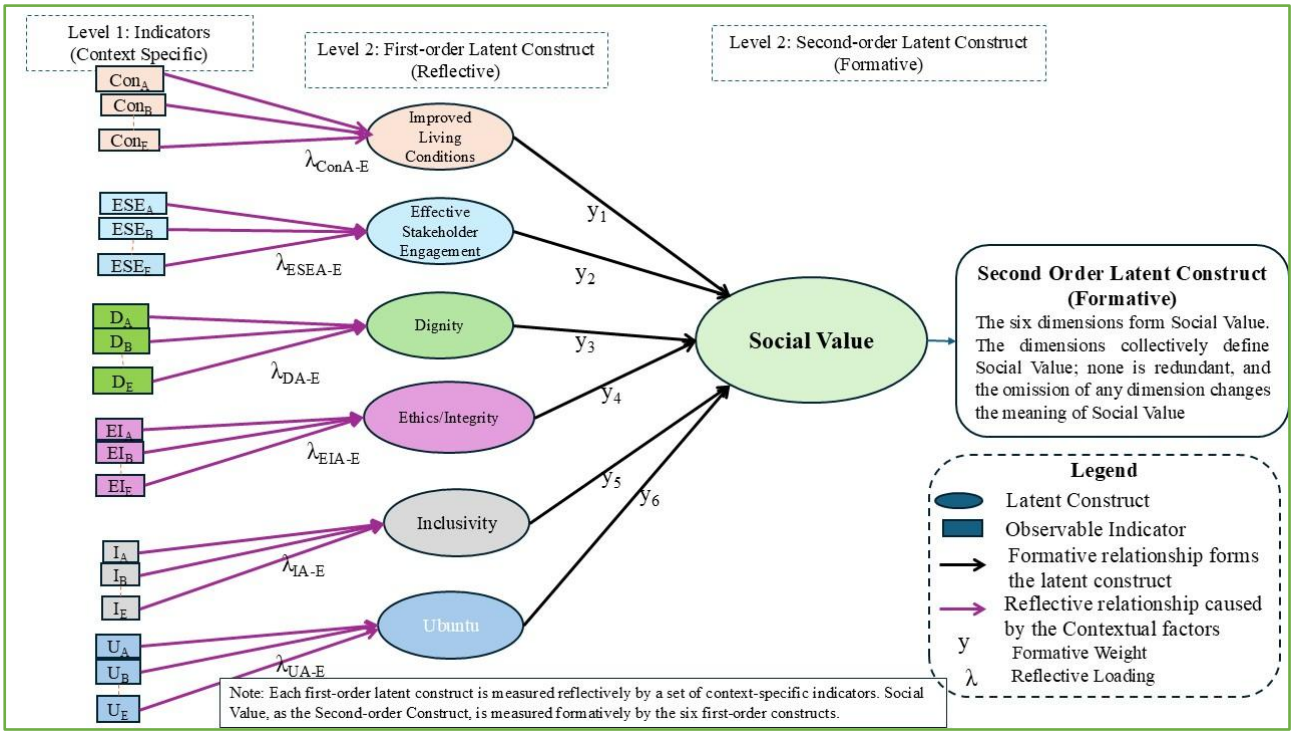
The theoretical framework constructed in this thesis has identified six determinant factors of social value, namely, observing the worth of human beings, engaging stakeholders, dignified approaches, ethics, protecting vulnerable groups, and Ubuntu as factors that are likely to constitute social value for the communities around the SKA project. In the next chapter, a measurement model based on the established theoretical relationship between these factors and social value will be developed and used to measure the existence of social value in the area.

Conceptual Modelling

The relationships between social value and its determinants can best be represented in a structural model. This thesis conceptualised social value as a multidimensional construct that arises out of six dimensions, namely Observing the Worth of Human Beings, Effective Stakeholder Engagement, Dignity, Ethics and Integrity, Inclusivity, and Ubuntu. Although these factors are interrelated, they are distinct with no established theoretical interlinkages among them; as such, they are not necessarily expected to correlate. These dimensions of social value are not directly observable but measured through a collection of context-specific

Figure 3

Hierarchical Conceptual Model of Social Value



observed and measurable items. The dimensions of social value are latent variables as they are not directly measurable but are reflected in their respective items. The structural model representing these relationships is shown in Figure 3.

As reflected in Figure 3, the reflective measurement is represented by arrows pointing from the latent constructs (Social Value elements) to their respective indicators. Each latent construct is measured by five factors (A – E). The Greek letter λ (lambda) represents the factor

loadings. This reflective specification assumes that the observed contextual factors cause the underlying latent construct (Becker et al., 2012). The six first-order latent constructs are: Improved Living Conditions, Effective Stakeholder Engagement, Dignity, Ethics/Integrity, Inclusivity and Ubuntu

At the second-order level, the Social Value is specified as a formative higher-order construct. The six first-order constructs serve as formative indicators of the Social Value, with directional arrows pointing from each first-order construct toward the higher-order construct, weighted by γ (gamma) with coefficients (Y_1 to Y_6). In formative models, the lower-order dimensions are viewed as defining characteristics that collectively cause or constitute the higher-order construct (Hanafiah, 2020). Consistent with this perspective, the model posits that social value is composed of six dimensions, which come together in a composite form to give effect to social value. The absence, inadequacy or alteration of any single element would alter the conceptual meaning and content of social value. This reflective-formative hierarchical specification aligns with theoretical arguments that social value is context-specific and is best understood as being formed by, rather than reflected in, its constituent dimensions. The model thus integrates both measurement (reflective first order) and structural (formative second order) components within a single analytical framework, allowing for the simultaneous assessment of measurement quality at the lower level and the composition of the higher-order construct. The proposed model provides a theoretically and culturally nuanced representation of social value in general, grounded in context-specific indicators while acknowledging the multidimensional and emergent nature of the construct. Structural Equation Modelling techniques will be used to conduct an empirical analysis of the first-order reflective elements and their relative contribution to the overall Social Value construct.

Summary and Conclusion

The main objective of this chapter was to develop the theoretical framework for the study. The chapter is grounded in the concept of Social Value as a measurable construct, supported by humanistic management within a social entrepreneurship context. Social capital theory was used to provide an ontological basis for social entrepreneurship, not to define it fully, but to outline its broad character. The central assumption to be tested is that applying humanistic management principles within a social entrepreneurship framework will generate social value. This assumption will be examined in relation to the socioeconomic initiatives of the SKA project in its surrounding towns, with particular focus on Carnarvon because of its central location and accessibility.

The entry point of discussion was to first trace the historical development of the concept of humanism. The literature revealed that the concept is as old as humanity, but has evolved and matured over time, transitioning from an intellectualist philosophy that was interested in an enlightened description of what it means to be human, into a more nuanced management paradigm and organisational practice that focuses on human well-being and the promotion of social and environmental considerations as opposed to the prioritisation of financial gains.

Discussions in this section further pointed to the positive effects of an organisational structure that incorporates humanistic principles; however, there are cautions that humanism should be approached with care, as it may sometimes prove difficult to coexist with other business imperatives that are essential for organisational success and profit making. Several organisations were found to have attempted to organise in a humanistic way but failed because of the inappropriate application of the principles.

Humanism was found to have developed significantly within academia and also in practice in European and Asian countries, with minimal development in Africa. Leadership approaches and cultural practices in the European and Asian regions, including the US, were

found to support the implementation of humanism as a philosophy. The Chinese Confucian philosophy of inner virtue, morality, and respect for the community and its values, for example, was found to be one cultural practice that had strong links to humanism. However, the African leadership culture was found to be devoid of humanistic characteristics. Literature suggests that Africa stands a greater chance of benefiting from humanistic leadership as it aligns with the African culture of Ubuntu. Adopting humanism as a focal organisational management philosophy in the African context has the potential to deal with the multiple societal problems plaguing African societies.

As an organisational leadership imperative, literature pointed to humanistic management as aligned with leadership characteristics that work together to restore human dignity and empower marginalised societies, such as indigenous groups. These characteristics are critical in promoting economic development through activities such as tourism and sports management.

Discussions in this chapter went on to examine the sociocultural conditions of the Upper Karoo, which is the focus area of this study. The reviewed literature revealed that the area is generally disadvantaged, marginalised, and laden with several social problems. It is the hypothetical proposition of this study that humanistic management approaches stand a better chance of improving the social conditions in the area while restoring the dignity of the people and creating impactful social value in the community.

The next section looked at the interface between humanism and social entrepreneurship. By its ontological disposition, social entrepreneurship allows for the implementation of humanistic management principles, as the intention is to empower people by addressing specific problems that exist within their society. This approach is, by default, humanistic, given that it puts the human being and their dignity at the centre of things. Social entrepreneurship brings together aspects of stakeholder recognition and engagement, integrity and ethics, and

empowerment of vulnerable groups such as women and children, while taking into account the relevant social and cultural conditions, to restore, protect, and uphold human dignity, thereby creating social value. Humanism and social entrepreneurship are philosophically complementary as they both prioritise the well-being and thriving of individuals and societies.

The reviewed literature suggests that the application of humanistic principles in a social entrepreneurship environment could serve a significant role in uplifting the sociocultural conditions of the impoverished towns of the Upper Karoo area under consideration in this study, given that the SKA project is implementing programmes and initiatives in the local communities to address their socioeconomic plights. It is hypothesised that the integration of humanistic principles in the management of socioeconomic initiatives of the SKA will create social value in the area. Social value is recognised as a latent variable, as it is not directly measurable, and an appropriate statistical model that will measure its determinant was developed.

This literature review sets the appropriate theoretical framework within which the role of the Square Kilometre Array in enhancing socioeconomic sustainability in the Karoo using social entrepreneurship will be explored.

CHAPTER 3: RESEARCH METHOD

Introduction

The preceding chapters of this thesis focused on the section of the research design referred to by Verschuren et al. (2010) as the conceptual design phase. The conceptual design is concerned with the objectives and goals of the research project. It initially identifies an existing mischief within a specific context and framework that can be solved or addressed with new knowledge created through a scientific process (Verschuren et al., 2010). The identified mischief, context and framework within which it would be addressed constitute the research objectives and rationale for the study. Research questions are thereafter formulated, the answers to which will constitute the specific knowledge required to address the mischief.

The mischief that this thesis sets out to deal with is the existing disjuncture between the social developmental objectives of Big Science initiatives, using the SKA project as a test case, and the value-creating developmental expectations of the people of Carnarvon, whose land, resources, and space are utilised for the development of the SKA project. The current situation has proven to be detrimental to the socioeconomic conditions of the community, and if left unattended, has the likelihood of creating chaos for the project and also further impoverishment for the community. The purpose of this thesis, therefore, is to develop a framework that will be used by the implementers of Big Science initiatives to integrate local societal developmental mandates in the planning and execution of the projects. In utilising the framework, Big Science initiatives will directly contribute towards sustainable social development in economically depressed communities, thereby supporting some of the United Nations' Sustainable Development Goals.

This chapter will focus on the second part of the research structure, which, according to Verschuren et al. (2010), is the technical design. The technical design concerns itself with how, where, and when the research will be conducted to answer the research questions. Planning on

the how, where, and when involves making decisions about the research methods that will be used, decisions about the population and sample, instruments and tools, procedures to be followed in collecting data, and any ethical issues under consideration, and finally a decision on how the specific variables will be measured and how they will be linked to the research questions. The rest of the Chapter will deal with these issues.

Research Approach and Design

The design of research projects, which largely rests on the decision of the specific research methodology to use, can take on one of the three basic approaches, namely qualitative, quantitative, or mixed methods. Each approach has multiple variations that depend on the nature of the research questions to be answered. The specific approach would be structured around the researchers' philosophical assumptions about the nature of knowledge and how knowledge is created as a basis of their epistemological orientation (Zegeye, 2009). The specific approach opted for will be evident in the techniques used to collect and analyse the data. The qualitative methods, informed by an epistemological orientation that says knowledge is not absolute, the process and environment within which knowledge is created will be subjective and inductive (Walliman, 2010; Cruz, 2019) This approach will call for data collection techniques that are suited for examining experiences, behaviours, and relations to enable the researcher to understand the nature and complexity of the phenomena being examined (Basias & Pollalis, 2018). Examples of those include interviews and embedded observations. The quantitative approach, on the other hand, will be informed by a view of knowledge creation that believes in the absoluteness and rigidity of knowledge, thereby opting for tools such as a survey questionnaire or a rigid test, yielding numbers that can be crunched through mathematical models to come up with an absolute explanation of phenomena (Basias & Pollalis, 2018).

However, epistemological considerations may, in certain instances, not be the main driver of methodological choice, as observed by Guba and Lincoln (1994), the qualitative and quantitative approaches may be tied to a specific worldview or paradigm, but based on the objectives and nature of the questions to be answered, the barrier between the rigid knowledge creation paradigm and the fluid qualitative approach can be collapsed and the two merged to create a robust and rich approach in a mixed-methods approach. Guba and Lincoln (1994) believe that the overarching framework guiding the knowledge creation process takes precedence over the specific techniques to be used, and collapsing the paradigm divide between the qualitative and quantitative processes becomes the guiding principle that will determine the approach used in this thesis, hence the mixed methods approach.

The iterative-parallel perspective calls for a constant review of the research design process, where the researcher constantly returns to the previous designs to evaluate if there are necessary changes based on the latest decisions and processes involved (Verschuren et al., 2010). Deciding on a specific research design approach upfront serves as a guiding framework for the research process; however, a revision of the methods is possible once the actual implementation of the research process is underway. Bryman (2006) observes that unanticipated findings during data analysis may result in unanticipated consequences of the chosen research design, thereby necessitating a refinement of the methodological approach. The flexibility associated with this approach inevitably lends credibility and enhances the quality of the project. As such, once the initial data is collected and organised for analysis, a review of the proposed methodology design will be conducted to ascertain if it is still the best approach to lead to the expected outcome of this study.

A clear understanding of the various methodological approaches is required in order to clarify how the mixed-methods approach was opted for as the suitable approach for this study. The next section discusses the various methodologies.

The Qualitative Approach

Without attempting to define qualitative research, the elements of the research approach that set it apart from the other approaches will be discussed. As the name suggests, qualitative research deals with the qualitative descriptions of phenomena as opposed to the quantification of numbers, the goal thereof being to search for deeper meaning (Zegeye, 2009). The qualitative methodology explores why or how a phenomenon occurs to develop a theory or describe the nature of an individual's experience (Berman, 2017).

The type of data suitable for qualitative analysis would be non-numeric interactive data, which includes words, actions, and expressions usually collected via open-ended questionnaires, interviews, observations, or narratives (Creswell, 1994). Although the qualitative approach places a high reliance on the researcher's worldview and experience and also takes much longer to complete due to possible iterations and redesigns, it allows for an in-depth understanding of the complex phenomenon. It is, therefore, suitable for investigating complex phenomena within their natural settings.

In the context of this study, the qualitative approach would be more appropriate to deal with the first research question, asking what the nature of the social value is as expected by the people of Carnarvon. This question seeks to uncover the nature of social value from the perspective of the community members. Answering this question would require a deep dive into the views, experiences, and sentiments of the community members to understand what and how they describe social value. This approach is in line with the description of the qualitative process by (Basias & Pollalis, 2018) as an interpretive process that seeks to examine experiences, behaviours, and relationships to answer the what, how, and why questions.

The Quantitative Approach

The quantitative approach deals with data that is numerically quantifiable, driven by a deductive objective epistemological perspective (Kamil, 2004). With this approach, central

themes and relationships can be missed due to a rigid focus on numbers, as such, individual experiences cannot be generalised; however, the approach as a methodological design is suitable for instances where large amounts of data are involved (Basias & Pollalis, 2018). Taking the quantitative approach would be necessitated by a need to understand a phenomenon through its quantification, answering research questions framed around quantities such as how much, to what extent, how many, how often, and similar structured questions.

The second research question of this thesis is framed around the extent to which social value exists in the Carnarvon area. Since it deals with the question of "extent", it would require a quantitative approach to appropriately quantify the extent of the social value.

Mixed Methods Design

Often, especially in recent studies, researchers are increasingly moving towards an approach that integrates both quantitative and qualitative methods in their studies. This approach is known as the mixed methods approach. Data collection and analysis are largely the defining features of qualitative and quantitative studies; as such, multi-strategy approaches entail the collection and analysis of both qualitative and quantitative data. Bryman (2006) identifies five typologies of mixed methods, which help to clarify, upfront, the nature of the intentions of the study, even though most of the typologies are only a record of what is logically possible as opposed to what has been practically implemented in previous research. Each type of mixed methods approach is categorised by a specific strand, which encompasses the overall approach in the implementation. The approach could be a sequential or simultaneous data collection, with one methodology taking priority over the other, identifying the purpose of the integration as the stage at which the integration takes place and whether there are multiple or singular data strands (Bryman, 2006).

There are multiple typologies of the mixed methods approach, characteristic of the data collection and analysis approach, as well as the point of integration. Kajamaa et al. (2020)

explains the different processes simply and straightforwardly. The sequential exploratory mixed-methods design employs data collection and analysis using one method, followed by data collection and analysis using the second method, and thereafter linking the results of the two methods to test the veracity of the first process. The data collection technique of the second method is informed by the first process, with the tool designed around the findings of the first process, such that the second process builds upon and amplifies the findings of the first process. The sequential explanatory mixed methods design applies the same process of data collection and analysis; however, in this case, the point of integration seeks to explain the results of the first method using the second method. A third type is the convergent approach, where data is collected and analysed simultaneously using two methods. Here, the researcher is looking for convergence in the results that corroborates the validity of the conclusions drawn from the different methods. Lastly, the nested mixed methods approach, where both methods are applied simultaneously, but one method dominates and the other is embedded within the other to amplify the results.

The next section will reflect on the choice of the methodological approach in this study and outline the associated methods, instruments, and techniques.

Methodological Design

Given the nature of the research questions to be addressed in this study, a mixed methods approach would be the most suitable. The first research question requires an in-depth analysis of the notion of social value within the context of the residents of the town of Carnarvon to establish the nature of the social value created through the implementation of the SKA project. The second question requires a quantitative approach to quantify the extent of sustainability of the identified social value. As such, the study will adopt a sequential design approach, where qualitative methods of data collection and data analysis of the first component relating to the

first research question take place first, followed by quantitative data collection and data analysis concerning the second component. The second component is dependent on the outcomes of the first component; the Mixed Method Exploratory dependent design (Schoonenboom & Johnson, 2017) is deemed appropriate.

Schoonenboom and Johnson (2017) believe that a point of integration of the two methods must be clearly defined to illustrate the point of mixture. In alignment with this point of view, the envisaged point of integration for this study is perceived to be at two points of convergence. Firstly, the two methods will merge when the results of the qualitative method inform the data collection for the quantitative method. The second point of convergence exists at the analytical stage, where the results of both methods are combined to develop a model for sustainable value.

The specific typology adopted for this study is the Exploratory Sequential Design (Schoonenboom & Johnson, 2017) whereby the first phase of qualitative data collection and analysis is followed by the collection of quantitative data to test the initial qualitative results.

Due to the rigorous nature of qualitative methods, it is envisaged that the initial part of the study might take much longer than expected; however, the researcher needs to be aware of the limits and ensure that the process is managed effectively to avoid unnecessary delays and time-consuming activities. Thorough planning of the data collection and analysis process will need to be adhered to in order to expedite the process and save valuable time. Annexure A shows the schematic approach to the research process.

Having established the methodological approach for this study, the next section will describe the processes and techniques used in the sampling, and also describe the tools and materials to be used for data collection and analysis processes.

Population and Sampling

The study deals with three research questions that require different research techniques and approaches to examine. The first question seeks to establish what the community views as social value in relation to their circumstances. In this regard, the research proceeds from an objectivist epistemological viewpoint that multiple realities exist, and individuals create their understanding of reality within their context (Ryan, 2018). For a researcher to establish an understanding of the subjects' perspectives, he/she needs to immerse him/herself within the context of the subjects to conduct an in-depth probe of the phenomenon in question; it is generally accepted that qualitative methods are best suited to yield appropriate results in such cases (Krauss, 2005). It is for this reason that sampling techniques suitable for qualitative data collection will be used in the work related to answering the first research question.

The applicable population in this regard will be the community of the town of Carnarvon. There are three towns designated as direct beneficiaries of the SKA socioeconomic development programme, selected based on the SKA footprint; however, this study will focus only on the Carnarvon area as the town is considered the hub and the base from which these initiatives are implemented. Most of the SKA beneficiaries are concentrated in this town, and as such, a focus on this central area will provide a richer and deeper understanding of the nature of the social value created through these initiatives. Since the study seeks to understand what the community or society considers as social value, it would be prudent to consider the fundamental unit of society, the household, as the unit of analysis. Douglass and Gonlin (2012) consider the household as the fundamental unit of society, which offers critical information about the dynamics of society. A household would typically be defined by a physical structure that serves as a dwelling. Most households consist of family members, although individuals may be members of a household based on some other form of relationship other than being members of a family. The typical structure of the household would be in such a way that there

is an adult who takes overall responsibility for the affairs of the household as the leader. In many cases, especially when the household is constituted by members of a family, it would be the mother or father who assumes the role of leader. In any other household arrangement, an adult would take on such a responsibility. Child-headed households are a rare exception and will be excluded from the population.

The households in Carnarvon will constitute the target population for this study, while the leaders of the households will be the target subjects. A sampling procedure where the researcher believes that there are specific groups of participants who hold important views about the issues being examined is called purposive sampling (Campbell et al., 2020). This sampling technique will be used in this case since it is believed that the heads of households will be the most appropriate target group to provide the most relevant and rich data for this study. Etikan (2016) identifies several sampling techniques that can be used when applying purposive sampling of a population. The Maximum Variation Sampling (MVS) technique will be applicable when selecting candidates across a broad spectrum to obtain a wide range of views from different perspectives. Homogeneous sampling is applicable when selecting individuals with similar characteristics or experiences to provide in-depth insights into the phenomenon under investigation. In this case, only heads of household will be selected. In this case, the heads of households will be purposefully sampled since they are considered to hold reliable information about socioeconomic dynamics in a community (Douglass & Gonlin, 2012) . In essence, therefore, a two-stage sampling approach will be applied. The first stage being the MVS approach, which assists in diversifying the reach, and the second technique to be applied after the MVS-based selection will be purposeful sampling targeting households within the diverse samples.

The Carnarvon community has households that are stratified according to their socioeconomic status, identifiable by the type of dwelling they occupy. There are three

identifiable tiers of socioeconomic status within the towns, and each tier resides in a specific section of the area. South Africa has different categories of residential areas, identifiable by the type of housing, which in turn depict the socioeconomic status of the residents. The suburbs, sometimes referred to as “Town”, usually have big houses, sometimes with multiple stories or gated housing complexes. These settlements are mostly situated close to central business districts and multiple amenities. This is where the affluent, high socioeconomic status individuals live. The second type is the “Township” or “Location” in the local lexicon. The type of housing in these areas is usually low-cost housing with two or three-bedroom units. Locations are usually further away from the central business districts and have fewer amenities and low economic activities. These settlements usually accommodate middle to lower income groups. The two types of community structures discussed above apply to Urban, semi-urban, and rural settlements. The rich and the poor in each type of settlement are easily distinguishable by the type of housing structure they occupy. The third and final group, which is the lowest tier in terms of socioeconomic level, resides in informal settlements. The most common type of housing structure in these areas consists of tin and fabric shelters. Most of these structures are not permanent as the residents are waiting for the government to provide housing for them, even though it sometimes takes many years, and the people continue to live in squalor since the settlements are informal and there are no services provided.

The three levels of socioeconomic status are likely to have different views about what would constitute their social value because their living conditions are very different. However, in the case of Carnarvon, these three different groups live side by side with each other and experience mostly similar challenges since the area and the population are very small. The first group resides in the area known as Dorp. This is an Afrikaans word meaning town. This group represents the highest socioeconomic level. The second group lives in the township called

Bonteheuwel. This is the middle-income group. The last tier occupies the most impoverished section of the town, and lives in the informal settlement called Die Bult.

In order to operationalise the MVS process, with the view of ensuring that a balanced collection of views coming from the three different tiers is obtained, a sampling applet will be used to determine the number of households that could be approached from each area. This will ensure that the views of the residents from each of the settlements are fully captured and represented in the narrative story of the specific Social Value in the Carnarvon context. Given that the MVS process is not the main sampling process, the analysis of the results obtained in the interviews will not necessarily consider the tiers but will approach the collective results as a unit. The outcome of the interviews will not be compared across the strata as it is believed that the entire Carnarvon community shares a common culture and is equally affected by the issues plaguing the area as a whole. The purpose of approaching the sampling from a stratified perspective is to ensure the richness of the data by drawing representative views from each section of the community.

The second research question seeks to quantify the social value and determine the extent to which it exists and its level of sustainability. The approach would be to test the elements of social value that will emerge from the qualitative analysis through a survey to gauge their extent of prevalence, thereby inferring the extent of social value and the level of social sustainability that exists in the community. Sustainability will be tested against the United Nations Sustainable Development Goals.

The third question is more of a theory development process that combines the outcomes of the qualitative and quantitative processes to develop a social value sustainability model. The qualitative themes emerging from the coding of the first data will be triangulated against the quantitative data to construct a theoretical model that begins to address the third research question. The theoretical background of humanism and social indentureship has been well

articulated in the previous chapter; as such, the qualitative and quantitative data will be examined to establish the validity of the theoretical assumptions.

Sample Size for the Qualitative Phase

Several scholars, for example, Marshall (1996), Staller (2021), and Subedi (2021) are of the view that the size of a sample in a qualitative study is trumped by the need to obtain satisfactory answers to the research question. The goal of a qualitative study is to establish an in-depth understanding of the phenomenon in question rather than achieve a representation of the study population (Subedi, 2021). Rather than aiming for a specific number, a qualitative study should, rather, aim for data saturation (Guest et al., 2020). Data saturation occurs when coding no longer reveals new themes or strands, whilst on the other hand, saturation can be reached when no new data is available (Fusch & Ness, 2015).

For the operationalisation of MVS process, a proportional number of possible respondents from each community tier will be identified from the population of households in the community of Carnarvon. According to the 2011 National Census statistics, Carnarvon spans a total area of 108,75 Km^2 with a population of 6,612 people (Statistics South Africa, 2010). These people are distributed within an estimated total of 1,552 households, occupying three areas demarcated according to their socioeconomic status, evident from the nature of the prevalent dwellings in the areas. The table below shows the distribution of households and populations within the subdivisions. The number of households per tier is estimated using the Municipal valuation roll; these numbers correspond to the estimated occupation density per square meter indicated in the National Census report (Statistics South Africa, 2010).

Table 1

Sampling of the Carnarvon Community

Sub-Area	Population	Area (Km^2)	Households	Sample
Carnarvon Town	2.497	0.88	624	48 (38%)
Bonteheuwel	3.862	91.53	965	74 (57%)
Die Bult	260	0.16	37	4 (5%)
Carnarvon Nature Reserve	0	16.19	0	0 (0%)

The area designated as Carnarvon Town is the most affluent, followed by Bonteheuwel, and Die Bult is the lowest tier of socioeconomic status. The Carnarvon Nature Reserve does not have any household dwellings, so it will not be included in the study.

The households will be approached in person at their homes to request their consent for participation, and interviews will be conducted with the heads of the households at their homes. An open source sampling applet was used to develop a systematic approach to the recruitment process and ensure a balanced representation of the households in the three different areas of Carnarvon. This will ensure that views from all corners of the town are included in the data collection process. The open-source random sampling applet was used to select the random samples for the qualitative part of the study. For Carnarvon Town (Tier 1), the total number of households (N) is 624, and the sample size is 48. In Bonteheuwel, the number of households (N) is 965, and the applet yielded 74 random samples. Finally, in Die Bult, the smallest of the three areas, there are 37 households, which yielded 4 samples. In each area, households were numbered sequentially from 1 up to the last (N^{th}) household. The selected samples are shown in Appendix C.

Although the total number of households targeted is 126, the qualitative interview process will focus on achieving saturation rather than interviewing all households. During

recruitment and interviews, households were identified by their street number and approached to obtain consent to participate. A semi-structured interview approach will be used for data collection.

Sample Size for the Quantitative Section

The SARAO implements a programme aimed at developing the socioeconomic status of the areas within the vicinity of the SKA project. The organisation believes that the socioeconomic initiatives implemented in the area add social value to the communities. However, as discussed earlier in this thesis, social value is a contextual construct, shaped by the views of the affected community. For instance, the SARAO believes that building a visitor centre in the community will improve the lives of the local people, but the community members themselves might prefer other forms of interventions that directly impact their poverty-stricken and impoverished social circumstances. It is for this reason that this study seeks to establish what the community views as social value within their circumstances before proceeding to measure the sustainability of such value and propose measures that Big Science projects can implement to ensure community-aligned value and sustainability.

The SARAO Socioeconomic Development program, or any other development programme for that matter, is supposed to cater to the entire community irrespective of social status; as such, this research will examine the extent of value in the entire community, incorporating the three tiers. As such, a purposeful sampling approach will be used. The size of the sample will depend on the number of individuals identified from the SARAO records as having participated in the socioeconomic development programmes. This sample will exclude people who are currently employed by SARAO, as it is envisaged that their employment status at the organisation might influence their responses. Employees of the organisation are also excluded from participating in the survey since the focus of the study is to obtain views from

the people who are receiving benefits from the organisation. Other studies, such as Binneman and Davis (2021), highlight some of the positive socioeconomic developments of the SKA project, evident in social impact areas such as job creation and economic opportunities, skills development and education, infrastructure developments such as road networks and broadband connectivity, and improved engagement and dialogue with community members. These views are developed mostly from the perspectives of the project implementers. Binneman and Davis (2021) also found that there were some negative impacts, such as the disruption of farming activities and conflicts arising from land use disputes, uneven distribution of socioeconomic opportunities, which exacerbates the plight of those who are excluded, the disruption of normal life activities in aa rural environment due to increased activity such as traffic and influx of foreigners, and a general lack of trust between the implementers of the SKA project and the community due to a perception of broken promises. However, this study does not intend to uncover the impact of the SKA project on the community, but it seeks to test the community's sentiments and views on how their Social Value has been affected and shaped by the presence of the SKA project; hence, only the specific members of the community who participated, one way or the other, in the socioeconomic development programme will be surveyed.

Based on information obtained from the SARAO Community Engagement Office, 155 direct beneficiaries were identified.

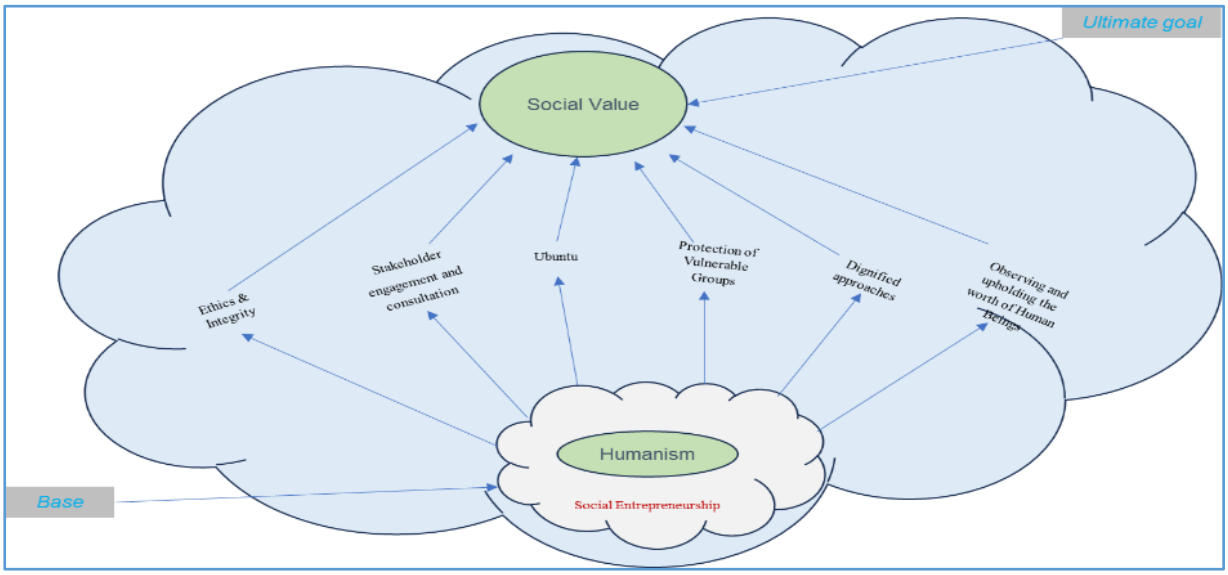
Operationalisation of Variables

The goal of this research is to establish the nature of the Social Value and gauge the extent of its sustainability to the people affected by the SKA project. It has been established in the theoretical framework section of this thesis that social value is rooted in the dignity of the people. The theoretical framework established that social value accrues when the dignity of the people is protected and upheld. It was further established that humanistic management

approaches are based on the protection and promotion of human dignity. Furthermore, humanistic management is effectively practised within a social entrepreneurship environment. It follows that, to determine if socioeconomic initiatives are providing value to the people, one needs to establish if there are humanistic management approaches incorporated within the management of the programmes. Furthermore, the value will be more meaningful and sustainable if implemented within a social entrepreneurship environment, thereby aligned with and addressing specific Sustainable Development Goals. The relational ecosystem of the envisaged variables is mapped out in Figure 4.

Figure 4

Social Value Determinant Variables Ecosystem



The theoretical postulate of the model in Figure 3 is that social value is determined by the six factors, namely dignified approaches, observing and upholding the worth of human beings, ethics and integrity, stakeholder engagement and consultation, protection of vulnerable groups, and ubuntu. These factors are believed to collectively contribute to the existence of social value in a particular society. Through the works of Camargo & Vázquez-Maguirre (2021), Pirson (2018), and Vázquez-Maguirre (2020) it was established that management principles that are focused on protecting the dignity of people while upholding and preserving

their worth as human beings are the driving impetus of the humanism movement. Any environment that seeks to achieve positive results through the implementation of humanistic principles should be organised in a way that enables and promotes the upliftment of the dignity and worth of the people.

The theoretical determinants of social value were derived from the analysis of the structural ontology of humanism and social entrepreneurship. The concepts of stakeholder engagement and communication, which are based on principles of emotional support and socialising across the broader stakeholder base, were found in the works of Vora and Kainzbauer (2020) and Yang et al. (2020) to be a key feature of humanism. Asian communities, for instance, thrive on these principles. Furthermore, Anadol and Behery (2020) and Kim et al. (2020) found that ethics, integrity and inclusivity, as well as protecting vulnerable groups such as women, children and the disabled, are necessary factors required to ensure that the dignity and worth of human beings are upheld in a thriving humanistic environment. Lastly, the concept of Ubuntu is brought in to consolidate humanism in an African context. Ogo (2019) suggested that the African culture tends to inhibit free expression and prioritises subjugation and authoritarian control. Blending the spirit of Ubuntu in humanism practices will be an attempt to reverse the stiff cultural approaches of the African environment, thereby assisting with seamless integration of dignity-focused practices. Social entrepreneurship, on the other hand, provides a fertile ground for the infusion of humanistic practices due to its social compact approach, which focuses on pulling together all active participants within the social problem-tackling enterprise to achieve the common goal of creating social value.

In this regard, social value is, therefore, conceptualised as a higher-order latent construct formed by the six theoretically grounded dimensions, as specified earlier. Each dimension is modelled as a first-order reflective construct, measured by context-specific observed indicators. At the second-order level, social value is specified as a formative construct, whereby

the six dimensions collectively define its meaning. This hierarchical component model reflects a reflective–formative specification, consistent with established guidance on higher-order constructs in structural equation modelling (Sarstedt et al., 2019).

Data Collection Tool for the Semi-Structured Interviews

Easwaramoorthy and Zarinpoush (2006) confirm that there are no specific questions to follow when using a Semi-Structured Interview (SSI) data collection methodology. The researcher is free to lead a discussion that is aimed at gathering information about the respondents' opinions, feelings, views, and experiences. The tool used in SSI is more of a guide rather than a questionnaire (Adams, 2015). The tool will have guiding questions that start conversations on the specific topic to be discussed; however, the questions may be dealt with in any particular order depending on how the conversation flows (Adams, 2015). The guide allows for probing and follow-up questions depending on the flow of the discussion and the depth of information provided.

In standardised interviews, the wording and sequence of the questions must be consistent, to ensure that whatever differences in the answers are obtained are not necessarily due to the questions or the wording of the questions but are due to the differences in experiences and opinions of the respondents (Barriball & While, 1994). However, in the case of SSI, which will be used in this case, the aim is not to standardise the wording and sequence of questioning but to ensure equivalence of meaning (Barriball & While, 1994). To maintain consistency and ensure the validity of the instrument, a protocol is developed. There are multiple approaches to developing an SSI protocol in terms of designing the flow of questioning. The most favourable, as discussed by Harrell and Bradley (2009), is the inverted funnel protocol. This protocol prefers an approach where the interviewer starts by asking closed-ended questions to first establish rapport and a sense of comfort with the respondent before gradually delving into the

questions relevant to the topic at hand. This approach is necessary to ensure that the respondent is relaxed and has trust in the interviewer. This way, they will be open to sharing their views and opinions freely. The protocol to be used in this study, adapted from McAuley (2019), was used in a qualitative study to interview members of a community-based organisation to collect information about the implementation of social and emotional learning in a school environment. The objectives associated with McAuley's (2019) data collection process and the overall approach of the study are congruent with the purpose, intentions, and approach of this thesis; hence, the interview guide was found to be useful and relevant. A sample of the tool is appended in Appendix C.

The preliminary process of the interview will start with the researcher explaining the purpose of the study and reading out to the participant the contents of the informed consent form. The participant will be allowed to ask questions about the study and also express any concerns or preferences regarding the interview process. Once the respondent has indicated their willingness to participate in the interview and provided the necessary consent as well as consent to be recorded, the formal informed consent process will be administered. The process involves signing the informed consent form by both the researcher and the participant. This process will be used as the icebreaker to make the participant comfortable and also gain the trust of the interviewer. The next set of questions will depend on the flow of the conversation, but first, establishing the period of residence in Carnarvon so as to determine whether the participants will be able to make a comparison in the living conditions between the time before the SKA project was initiated and the current time. The other area of focus will be the participants' experience of the SKA socioeconomic programmes and how they feel about their interactions with the staff.

The data collected in this phase of the study will be analysed immediately after collection, while emerging themes are observed to achieve thematic saturation. The themes emerging from

this analysis will inform the quantitative process that seeks to determine the extent of sustainability of the social value.

Quantitative Variables

The qualitative leg of this Mixed Methods Sequential Exploratory (MMSE) study is designed to explicate themes that describe the nature of social value as perceived by the people of Carnarvon. It is envisaged that the descriptors of the social value will be classified within its six determinants as identified earlier. These strands will form the variables to be measured using quantitative methods to gauge their influence on the social value, which will, in turn, explain its level of sustainability.

The data collection instrument for the survey to be used in the quantitative leg of the study will be designed based on the strands that emerge from the qualitative analysis. A survey questionnaire will be distributed to the community members in various formats.

Operational Definition of Variables

The structural equation model described earlier depicts a two-stage hierarchical setup, positioning Social value as a second-order formative latent variable formed by the theoretically determined first-order elements (Improved Living Conditions, Effective Stakeholder Engagement, Dignity, Ethics/Integrity, Inclusivity and Ubuntu). At the higher level, social value is the endogenous dependent variable with respect to the first-order elements as they predict it; hence, it has incoming structural paths in the model shown in Figure 3. The first-order elements are independent as they form the second-order construct (Social Value).

At the lower level, the observed manifest factors are independent as they are the ultimate sources, reflecting their respective first-order constructs, and the first-order constructs are dependent variables at this level. The second-order constructs function as mediators or key

explanatory variables: they summarise the joint effect of the first-order constructs and transmit that to the social value. This setup achieves parsimony by reducing direct paths from multiple first-order constructs to many outcomes.

The Disjoint Two-Stage Approach (Becker et al., 2012; Hanafiah, 2020; Sarstedt et al., 2019) will be adopted to determine how each first-order construct contributes to social value. At the first stage, the first-order constructs will be estimated using the contextual factors as predictors. The second stage will use the latent variable scores of the six first-order constructs as formative indicators of social value. This approach, based on recommendations from Becker et al. (2012) and Sarstedt et al. (2019), has the potential to reduce bias in estimating the relationships from contextual factors to the first-order constructs and provides reliable weights indicating each dimension's contribution to the Social Value construct.

Administering the Survey

The target population for the survey is the group of people who have participated in any of the SARAO socioeconomic development programmes. The list and contacts of the participants will be obtained from the SARAO Stakeholder Engagement Office in Carnarvon. The targeted participants will be contacted in person for those who are in Carnarvon. It is expected that the majority of them are available in Carnarvon to be contacted in person. Those who are outside Carnarvon and cannot be reached in person will be contacted via email or text.

Hard copies of the survey questionnaire will be delivered and handed out to the respondents and collected when they have completed the survey. The survey is expected to last about 25 minutes; however, respondents who are unable to complete the survey immediately will be given the latitude to complete it in their own time and return at a time agreed between the researcher and the respondent.

Study Procedure and Ethical Assurances

Ethical Assurances

Before the commencement of data collection in this dissertation, the application for ethics approval was submitted to the Unicaf University Research Ethics Committee (UREC) on 2 November 2023, and approval was granted on 12 December 2023, valid until 31 July 2024. Data collection commenced in March 2024. The granting of ethics approval confirms that the design and approach of the study are fully compliant with the ethics requirements of the University.

Fouka and Mantzorou (2011) identify several key factors that must be observed by a researcher to ensure ethical research. At the top of the list is the concept of informed consent. Informed consent protects the research participant's autonomy, as it enables the participant to make an informed choice regarding their participation in a study and also protects their right to withdraw if they feel uncomfortable or suddenly change their mind about their participation (Fouka & Mantzorou, 2011). To ensure that informed consent is observed in this study, an informed consent form was designed. The informed consent form explains the purpose of the research and informs the participant of their role in the research. A sample of the informed consent form is included as Appendix H. Participants were required to sign the form to confirm their consent to participate in the study. The participants were further informed that, should they feel uncomfortable at any stage of the interviews, they are free to withdraw. The form was translated into Afrikaans, as many of the targeted participants are Afrikaans-speaking.

Other key factors impacting ethical research identified by Fouka and Mantzorou (2011) include beneficence, anonymity, confidentiality, and privacy. Beneficence, according to Pieper and Thomson (2016), is a virtuous personal characteristic that is demonstrated through good and charitable outcomes. A research project that observes the ethical principle of beneficence should improve the welfare of the people. In aligning with this principle, this dissertation will

endeavour to enhance the delivery of sustainable social value to the people of Carnarvon. It is expected that the outcomes of this study will contribute to interventions in socioeconomic development efforts by the SKA project and other similar Big Science initiatives. This will ensure that the result has a meaningful impact on the community, especially the less privileged ones. Observing the principle of beneficence also means that, while improving the welfare of people, there should be no harm or any form of deprivation of any of the people in the community. The researcher should take extra care not to leave the research environment in a worse condition than before. To this end, given that the data collection process involves human subjects through face-to-face interviews and survey questionnaires, care is taken to ensure there is no risk of harm to either the participants or the environment. Limiting the possibilities of harm to the environment and the people means not subjecting the participants to any process that may result in physical harm. However, the flow of information and personal interactions may have the potential to cause emotional and psychological harm; as such, the researcher should take care not to disseminate false, inaccurate, or sensitive information that may cause harm to the people. The researcher should further treat the people with respect and ensure that their dignity and worth as human beings is preserved and protected throughout the data collection process. In the case of the environment, this study poses no direct threat as it does not involve any environmental-related process. The researcher should ensure that during the data collection process, there is no pollution or any irresponsible use of resources.

The design and approach of the data collection process pose no threat to the community as the targeted population does not include any individuals who may be considered vulnerable in terms of age, health, or socioeconomic status. Furthermore, no substance of any sort will be administered to the participants, and the data collection process in the form of interviews and a survey is not expected to yield any form of discomfort to the participants.

To ensure anonymity, the personal information collected, which includes signatures, names, and residential addresses, will be kept separate from the interview recordings and transcripts. A coding system is used to link the register to the recording and transcript. This is done to enable the researcher to identify the respondent in a particular transcript in the case when a follow-up interview may be required. Confidentiality was maintained by way of excluding any personal information from the recorded interviews, and the recorded demographics did not include any identifying characteristics such as name, Identification number or residential address. All the information collected from the respondents is kept in a password-protected electronic file, while the hard copies are kept under lock and key, which is kept by the researcher.

Finally, the important aspect of protecting the privacy of respondents was considered, and the design of the study ensured that the interview transcripts containing private information such as beliefs, attitudes, and opinions shared during the interview were kept under lock and key by the researcher. The electronic documents are kept in a password-protected portable storage device. This information will not be shared with any individual without the consent of the subject to protect their privacy.

Biases

Bias in research occurs when the researcher allows his/her subjectivity to influence the research process (Finn, 2006), thereby systematically distorting the results and findings of the research. Yarborough (2021) adds that once bias is allowed to creep into the research process, the results obtained will inevitably be far removed from the truth; as such, the knowledge produced may be detrimental to the body of science. It is, therefore, imperative for the researcher to be aware of the possible biases that could affect the results of his/her study to implement guarding mechanisms against their influence.

However, from a positivist point of view, where knowledge and the truth exist in multiple dimensions and specifically within a qualitative approach where the researcher immerses himself or herself within the study process, it may be difficult to completely eliminate bias. Mehra (2002) contends that if one's reality is based on their understanding of the world and their inner reality, their opinions, beliefs, and perceptions will inevitably stem from the basis of their knowledge creation within a research environment. It is therefore entirely possible to eliminate bias, especially within a qualitative environment. To further buttress the point, Mehra (2002), borrowing from Krieger's (1991) argument, emphasised that,

"(The) qualitative research paradigm believes that (the) researcher is an important part of the process. The researcher can't separate himself or herself from the topic/people he or she is studying; it is in the interaction between the researcher and that which is being researched that the knowledge is created. (As such) the researcher bias enters the picture even if the researcher tries to stay out of it" (Mehra, 2002, p.11)

Having said that, it should be emphasised that while accepting that the researcher's worldview inevitably influences how they interpret the results, this is not an open door for allowing one's perceptions to systematically sway the results away from the hard evidence obtained during the research process. In that regard, the researcher needs to accept that there are multiple truths out there and guard against allowing only their truth to emerge while ignoring and suppressing other truths that may be evident from the findings and results.

Finn (2006) proposes several measures that a researcher can take to minimise the influence of bias in their research. The most treacherous form of bias stems from our need to fulfill our expectations that are based on our perceptions, prior knowledge, our passion, previous experiences, or our desire to drive change in a particular direction. This self-fulfilling need to see things go our way leads to implicit bias, which is an involuntary preference or awareness of certain circumstances that support our intentions (Fiarman, 2016). Although our

intentions may be good, implicit bias may disadvantage other outcomes that may have been equally good or much more appropriate than our own intentions. The fact that these forms of biases are implicit means that it is hard to recognise them and therefore difficult to deal with them.

Finn's (2006) proposal is that the first step in dealing with this form of bias is to be aware that it exists. Fiarman (2016) agrees but takes the proposal further to say awareness alone will not necessarily solve the problem; the researcher needs to anticipate situations where unconscious bias may creep in and design systems to minimise it. To illustrate the powerful effect of the proposals by Fiarman (2016) and Finn (2006), the subject of this research study will be used. In this study, the researcher may harbour strong beliefs that Big Science projects do not benefit the communities within which they operate and initiate the study with a view to solving this problem. As the researcher has conceded to being passionate about and having strong beliefs about the relationship between these types of projects and the associated communities, he/she may unconsciously design the research objectives, the hypothesis, as well as the research instrument to align and support his/her views. When interviewing respondents, for instance, the researcher may adopt a demeanour and tone that induces the respondents to provide answers that confirm the researcher's views.

However, if the researcher is aware of the effects of such biases in the design and implementation of the study, at each stage of the research, the researcher will objectively interrogate his/her approaches and honestly reflect on whether any influences may arise out of his/her unconscious biases. In this specific study, the researcher declares that he is involved with the SKA project as part of the government oversight; as such, his interests lie in ensuring that the community benefits from the project. Having interacted with literature that discusses the manifestations and effects of unconscious bias in research, the researcher declares that he

is aware of this form of bias and has been continuously evaluating and safeguarding against its influence.

When conducting interviews, the researcher has intentionally kept a neutral approach to avoid influencing responses that are aimed at appeasing the researcher. Other forms of biases have been addressed through the Unicaf Research Ethics Committee (UREC) application for ethics clearance.

Data Collection and Analysis

Data Collection Plan

This study follows a sequential exploratory mixed methods design. It starts with the qualitative approach, which seeks to identify or confirm the theoretically elucidated constructs that determine the sustainability of the social development initiatives of the SKA project in Carnarvon. The SKA project implements several initiatives in the small town of Carnarvon within different sectors of the community, including in the education, economic, and social sectors. The number of initiatives in these different sectors is believed to collectively bring about socioeconomic development in the area; however, research has revealed that there is no empirical evidence to back this claim. The literature reviewed in this dissertation shows that it may be difficult to quantify the social value delivered through this socioeconomic development, however, the presence of social value and its sustainability can be inferred through the presence of certain factors that are integrated within the implementation of initiatives that are aimed at creating social value. These factors are identified as ethics and integrity, stakeholder engagement and consultation, ubuntu, protection of vulnerable groups, dignified approaches, and observing and upholding the worth of human beings. The qualitative data in this dissertation is focused on uncovering the specific conceptual elements that will be

measured to gauge the presence and extent of these factors, thereby proving the presence of social value.

The quantitative part of the study is designed to measure the extent of the presence of the social value factors through the analysis of the constructs uncovered during the qualitative leg of the study. A theoretical model will be developed to explain the relationship between the measured conceptual elements and the theoretically identified social value constructs to infer the extent and sustainability of the social value created by the SKA in Carnarvon.

A mixed methods approach means that there will be two legs of data collection, the first leg will collect and analyse qualitative data, and the second leg will collect and analyse quantitative data.

Qualitative Data

Data collection for the qualitative section of the dissertation will be conducted through face-to-face interviews. The focus area of the study is the town of Carnarvon, which is situated in the Northern Cape province in South Africa. Carnarvon is just over a thousand kilometres away from the place of residence and work of the researcher, which means that the researcher needs to travel and stay in Carnarvon for the duration of the interview process. A period of 10 days was set aside for the face-to-face interviews.

Carnarvon is predominantly an Afrikaans-speaking community, dominated by the white and coloured races. The services of an interpreter were acquired to assist with interpretation during the interviews. The necessary forms to be administered during the interviews, such as the informed consent forms and the gatekeeper letter, were translated into Afrikaans. Once in Carnarvon, the researcher and the translator went knocking on the doors of the households identified through the random sampling process. The process of visiting potential respondents in their homes included recruitment, administering the consent process, and the actual interview. The interviews were recorded using a handheld digital voice recorder. The

recordings were downloaded onto the researcher's laptop. During the interviews, an interviewee register was kept, recording the name, surname, residential address, and respondent's signature. The recording files were named according to the entry number on the register. This was done to enable the researcher to identify specific respondents by linking the recording to the respondent's details on the register, so that tracing can be possible in the case where the researcher needed to conduct a follow-up interview. The recordings were translated into English and transcribed. The electronic files of the transcriptions became the sources of data to be analysed.

Qualitative Data Analysis

The constant comparison technique for data analysis is by far the most popular method to use when analysing qualitative data (Leech & Onwuegbuzie, 2007). In any case, the technique was not chosen for use in this dissertation due to its popularity, but for its usefulness in the coding process. Here, the researcher intends to extract underlying themes from recorded interviews, extracting meaning from the words uttered by the respondents (Leech & Onwuegbuzie, 2007). This dissertation aims to uncover themes that seek to explain the presence or absence of social value in Carnarvon.

When coding data, the researcher can either use an inductive approach, where the data is approached with an open mind and search for any emerging themes. In this approach, the researcher will interview, observe, or otherwise engage with the research subjects while noting the themes that emerge. At a point where no new themes are emerging, the data collection process will stop, and saturation will have been reached (Leech & Onwuegbuzie, 2011).The other approach is to browse through collected data with the view of generating new themes, variations or dimensions of a predetermined theoretical position. Only information that supports or is relevant to the theoretical framework is extracted. At a point where the researcher feels that they have achieved sufficient theoretical depth, the analysis would stop, and

saturation would have been reached. This approach to qualitative data analysis is called deductive thematic analysis (Moore et al., 2026).

In the case of this dissertation, the deductive approach was adopted as the researcher has identified specific factors that could be used to explain the nature of social value created within a particular community; as such, the data will be approached to identify codes that are aligned with such factors. The researcher remains alive to the possibility that information could be discovered during the analysis that would necessitate the revision or realignment of the theoretically identified themes.

Manual coding was mainly preferred over computer-assisted qualitative data analysis software for practical reasons. The first consideration was based on time and resources. After spending considerable financial resources to travel to and lodge in Carnarvon for the data collection, it would have been a financial burden to acquire data analysis software. Furthermore, it would take a considerable amount of time to familiarise oneself with the software to the point of confidently using it to produce the required rigour of analysis. The main factor, however, is that (Basit, 2003) indicated that software is specifically useful when dealing with copious amounts of data usually generated through lengthy observations and repeated interviews, but most importantly, the use of software is most suited in cases where the researcher intends to quantify the data, which is not the case in this dissertation.

Based on the number of households in the area obtained from the latest population census report (Statistics South Africa, 2010) and verified against the Municipal valuation roll, a random sample of 120 respondents was identified. The coding process started with the researcher going through the data transcripts while annotating and marking out sections that stood out from the conversations. This process was quicker as the interviewer had already identified most of the key issues mentioned during the interviews. Keywords and phrases were isolated and grouped according to similarity, meaning, or relevance to some predetermined

theme. A spreadsheet of themes was created. The process continued until no new themes could be included in the spreadsheet. To ascertain that saturation had been reached, the researcher had to skim through all the transcripts searching for further new codes that could have been missed in the first round. The search function on Excel was used to verify if specific words or phrases already exist in the codes. The raw data of grouped codes forming themes is included in Annexure E. The themes are then further grouped into coherent chunks that represent the theoretically identified or emerging variables. These variables are then imported into the quantitative data collection process.

Quantitative Data

The quantitative data for the mixed methods exploratory study will be collected through a survey questionnaire. The survey questionnaire incorporates context-specific factors that will be measured to quantify the first-order variables identified in the structural equation model. A purposive sample of 320 participants was determined based on the number of individuals who received direct assistance or were directly involved in the SARAO socioeconomic development programmes. The information about these individuals was obtained from the SARAO stakeholder liaison office. This office is situated in Carnarvon and serves as the interlink between the community and the programme. It also has the responsibility of distributing socioeconomic benefits to the local communities.

To ensure quality data, a few measures were taken to safeguard the questionnaire administration process. Bowling (2005) identifies two major categories of error when administering a survey questionnaire. The non-measurement errors category is due to factors such as survey design, coverage of sampling, non-response, and item non-response, and the measurement errors category includes aspects such as the survey instrument and data collection processes. The next section details how each of the error factors is dealt with in this dissertation to minimise the possibility of error in administering the survey.

Survey design – the survey questionnaire was designed to ensure simplicity and to be respondent-friendly; as such, the length, the language and the sequence of questions were carefully crafted to ensure responder user-friendliness (Leung, 2001). The questionnaire is based on the Self-Efficacy Scale and was modified to include questions adapted for the Carnarvon environment and suitable for the specific purposes of measuring the context-specific. Care was taken to ensure that the questions were clear and used simple and straightforward language, but most importantly, to ensure that the questions did not invoke any form of biased answers by leaning more on one side of the issues being tested (Roopa & Rani, 2012).

Sampling – Bowling (2005) indicates that a less representative sample can lead to inadequate coverage of the population, thereby resulting in compromised data. The total population sampling technique was used to ensure complete representability of the target population (Bowling, 2005). A population of 155 direct participants of the SARAO Socioeconomic Development Programme was identified.

Non-response – non-response refers to the failure to obtain responses from some of the respondents in the identified sample or obtaining incomplete responses; a higher non-response rate could lead to non-response bias (Okafor, 2010). Some factors leading to non-response include inability to reach the respondents, communication barriers, complexity of the survey instrument and methods used in administering the survey (Bowling, 2005). To counter the possibility of non-response bias, the following steps; (1) the respondents will be approached in person during some of the many community gatherings, (2) the questionnaire will be thoroughly explained in the local language so that all participants have a common understanding of the purpose as well as the same interpretation of the questions, and (3) the questionnaire will be collected immediately after completion.

Data Type

The data to be analysed comes from scores of the observable context-specific variables measured using the Likert-type scale. It was theoretically established that the domain of humanism is influenced by the context-specific factors determined by the mediating latent variables, namely Observing the Worth of Human Beings (OWHB), Effective Stakeholder Engagement (ESE), Dignity (D), Ethics and Integrity (E&I), Inclusivity (Incl), and Ubuntu (U). These variables are not measurable directly as they cannot be attributed scores; they are designated as internal attributes of humanism in line with the factor analytic theory (Mertler et al., 2021). The preceding qualitative process uncovered specific factors, through the thematic classification process used in the qualitative data analysis, that are deemed important by the community in creating and maintaining their social value. These factors are designated as the observable surface attributes (Mertler et al., 2021), quantifiable in the measure of humanism. The survey instrument is designed to collect scores that can be used to measure these surface attributes.

In the conceptual model developed earlier, the dependent variable under investigation is social value. However, it should be noted that social value is a latent variable as it cannot be measured directly; as a result, its presence and the extent to which it exists, or the strength of its existence, will be determined through the evaluation of its determinants. As mentioned earlier, the specific factors giving rise to the determinants are uncovered through the qualitative process. The first research question seeks to establish the nature of social value as defined by local community members; this would be achieved through a qualitative process. Once the nature of social value is established, the quantitative process will assess the extent to which this social value has been implemented in the area.

Quantitative Data Analysis

The data analysis in the quantitative leg of this dissertation aims to quantify the prevalence of humanism in the management of the socioeconomic initiatives of the SKA programme in Carnarvon. It was theoretically established that the application of humanistic principles is evident from the interactions that include observing the worth of human beings, effective stakeholder engagement, upholding the dignity of individuals, ethics and integrity, inclusivity, and Ubuntu. It was further established that the collective presence of these factors gives rise to social value. The presence of humanism in the SKA socioeconomic development programme will be tested against the social value structural model developed in the preceding section.

The Partial Least Squares Structural Equation Modelling (PLS-SEM) technique will be used. Given that the analysis will, in the first instance, seek to validate the theoretically developed structural model and, in the second stage of analysis, evaluate the contributions of the social value determinants to the overall concept of Social Value, the disjoint two-stage approach in PLS-SEM (Rafiuddin et al., 2025) will be the most appropriate technique to utilise in the data analysis. The PLS-SEM method is recommended for the complex reflective-formative higher-order model adopted in this study given the small size of the sample (118). Becker et al. (2012), Rafiuddin et al. (2025), and Sarstedt et al. (2019) agree that the size of the sample may not necessarily be the main consideration when applying partial least squares analysis, the focus in confirming robustness will be on the statistical power.

Summary

The purpose of this section is to bring all the key elements of this chapter together and synthesise them to bring out the essence of the chapter in a succinct manner. The chapter starts with an introduction that sets the scene for the contents of the chapter. The introduction also recaps the problem statement and the purpose of the study. In summary, the problem that this

dissertation aims to address is associated with the lack of evidence-based and relevant socioeconomic development accruing to communities that host Big Science projects (Cruz, 2019; Gastrow & Oppelt, 2018; Horvat et al., 2021). The objective of the study would be to develop a model for socioeconomic development that brings social value to the deserving communities.

The research is designed around a mixed-methods exploratory approach (Schoonenboom & Johnson, 2017), combining the qualitative and quantitative methodologies. The qualitative approach will be used to develop themes that represent the underlying latent variables influencing the extent of humanism (Vázquez-Maguirre, 2020) in the implementation of socioeconomic development initiatives. The quantitative component will quantify the extent of social value developed through these initiatives. The focus population of the study is all the leaders of households in the community of Carnarvon. The household is the fundamental unit of society; as such, it offers critical information about the dynamics of the society (Douglass & Gonlin, 2012). A sample of 126 household heads was identified using the random sampling technique (Etikan, 2016). For the quantitative leg, a sample of 155 subjects was obtained from those confirmed as beneficiaries of the SKA Socioeconomic benefits programmes.

The next section in Chapter 3 addresses the variables to be measured. The goal of the data analysis process is to identify latent variables (Mertler et al., 2021) that influence the determinants of humanism, thereby inferring the strength and sustainability of social value created through the implementation of socioeconomic initiatives in Carnarvon. The Exploratory Factor Analysis statistical tool (Tucker & MacCallum, 1997) will be used on the SPSS platform to investigate the correlation between the latent variables and the determinants of humanism.

Issues of bias were also discussed in this chapter. Ethics approval was granted by the Unicaf Research Ethics Committee to proceed with data collection. Furthermore, the researcher

has taken necessary steps to ensure that all relevant ethical issues are addressed and measures to control for biases are implemented to ensure results are not compromised (Fiarman, 2016; Finn, 2006; Mehra, 2002; Yarborough, 2021). The key issue in terms of biases is that a researcher cannot completely eliminate bias, especially in qualitative research, but can put measures in place to ensure that his/her biases do not negatively affect the quality of the result (Mehra, 2002).

Lastly, the chapter dealt with the nature of the data to be analysed and the analysis techniques to be employed in analysing the data. The qualitative data are represented by interview transcripts that are analysed using the constant comparison technique, also known as coding (Leech & Onwuegbuzie, 2011). The quantitative data are the correlated variables' scores obtained through a questionnaire; this data is analysed using the Partial Least Squares Structural Equation Modelling. In the next Chapter, the outcome of the analysis will be discussed.

CHAPTER 4: FINDINGS

Introduction

This chapter deals with the analysis of data and reporting of the findings, building up to the reflections and conclusion in Chapter 5. The purpose of this thesis is threefold; firstly, it seeks to determine the nature of the social value in Carnarvon, from the perspective of the communities adjacent to the SKA project. After the nature of the value has been established, the thesis will determine the extent to which the specific type of value as envisaged and expected by the community has been delivered through the socioeconomic programmes implemented by the SKA.

The third leg aims to integrate the specific developmental imperatives emerging from the analysis of the local social value with outcomes of the determinants of the prevailing social conditions to develop a Big Science Project Socioeconomic Development Framework. This framework will aid in implementing socioeconomic development activities linked to Big Science initiatives to mitigate the disjointed expectations that exist between implementers of Big Science projects and the community members in which these projects are implemented. It will further aid in evaluating the social impact of the socioeconomic programmes.

The problem that this thesis addresses stems from the continued lack of tangible and impactful social value realised in communities situated within the operational area of Big Science initiatives. These projects are funded from the fiscal budget, competing for the stretched fiscal resources with the immediate and urgent developmental needs of the communities. The funding is allocated based on the widespread assumption that doing science naturally carries developmental consequences (Cruz, 2019; Ivanov, 2019; Mansell & Philbin, 2020). The implementers of Big Science projects continue to believe that implementing these projects invariably leads to social development, thereby justifying their social license to receive large budgets from the public purse, competing with real developmental necessities that are

directly affecting communities, more especially the economically depressed communities, such as Carnarvon, which is close to the SKA project. Promising and claiming development while there is nothing to show at the local level, as established by Gastrow and Oppelt (2018) and later by Basheer (2023), leaves communities in distress and creates false hope, creating a state of anxiety and anticipation.

In the preceding chapter, borrowing from previous research, it was shown that those who are directly involved with Big Science initiatives believe that there is a natural and seamless progression from the implementation of a Big Science project to the accrual of social value. The argument is that Big Science projects have always yielded new knowledge, technological advances, and innovative solutions that ultimately benefit society (Hickman, 2008). Developments such as the internet, microwave technology, X-rays, medical scanners, big data solutions, and similar inventions are cited as some of the positive developments realised because of the implementation of Big Science projects (Beck & Charitos, 2021). However, some of the research conducted in the areas adjacent to the SKA project points to a lack of direct impact on the local community, which may be a consequence of the non-existence of benefits or the inability to quantify social benefits if there are any. This leaves the community destitute and sometimes in much worse conditions than before. Binneman and Davis (2021) amplify this point by pointing out the loss of livelihoods and cultural erosion associated with the alternative use of heritage lands. Reports of socioeconomic development analysis, for example Atkinson et al. (2017) and Urban-Econ Development Economists (2023), in the towns surrounding the SKA project mention developments such as education support, bursaries for students, training of astronomers, technological advancements and innovation, an increase in the global science ranking for the country, increase in the number of scientific publications – these developments, although commendable and very significant at a national and global level, they, nonetheless, reflect the hegemonic and elitist approach to development which does not

consider local needs such as putting food on the table for the local impoverished community members. Butler's (2018) findings underscore the plight of the impoverished communities around the SKA, noting that the developmental needs of the people of Carnarvon are pushed into the periphery since they are not aligned with the elitist notion of development adopted by Big Science initiatives. If this situation is not corrected, spending public funds on these projects will remain a fruitless endeavour that continues to perpetuate poverty and fails to contribute to the broader national developmental imperatives in underdeveloped nations, and also fails to support the United Nations' Sustainable Development Goals.

The data to be presented in this chapter first seeks to answer the question, what is the nature of social value as defined by, and from the perspective of, the local people? The analysis and results of the qualitative data obtained through the semi-structured interviews will be dedicated to addressing this question. The second question to be answered is, to what extent has the social value, as defined and anticipated by the local people, been implemented in the local community? This question is answered by the quantitative data obtained through a survey questionnaire. The quantitative data obtained from the questionnaire are analysed using a series of statistical models to first validate a theoretical model of social value and then test the prevalence of contextual factors that are supposed to form social value in Carnarvon.

This Chapter will first discuss the concept of trustworthiness of data as it applies to qualitative data and the concepts of reliability and validity as applied to quantitative data. This section will cover the theoretical aspects of the four elements of trustworthiness in detail and culminate with the application of these elements in this thesis. A similar discussion regarding the quantitative data will follow. The section confirming the trustworthiness, reliability, and validity of the data will be followed by the presentation of the results and the evaluation of findings in relation to the research questions and hypotheses.

Trustworthiness of Data

The purpose of gathering the qualitative data for this research was to explore the participants' views, thoughts, expectations, and beliefs about what constitutes social value to them as the recipients of the socioeconomic programmes of the SKA project in Carnarvon. Uncovering and making sense of people's views, beliefs, thoughts, and expectations is a subjective process (Sirwan, 2024). The concept of subjectivity can best be described by the fable of the six blind men who tried to figure out what an elephant looks like by feeling it with their hands. Each one of them touched a different part of the elephant and concluded differently from the others as to the nature of the creature, since their perception was shaped by the specific part of the elephant that they touched (Maher et al., 2018). This story illustrates the fact that subjectivity is the product of one's perception. A person's internalised life experiences and processes, the intricate interactions of body, thoughts, and actions in the social and cultural context within which one exists, shape a person's perceptions of the world around them, thereby influencing their subjectivity (Kirschner, 2021). The same holds for data analysis within the qualitative approach.

If the process of conducting qualitative research is subjective, it follows that the outcome of the interpretation of qualitative results is predicated on the researcher's internalised life experiences and context, hence the strongly held view of researchers such as Aldiabat and Le Navenec (2014), Glaser (2019), and Timonen et al. (2018) that the results of a qualitative approach have low trustworthiness. However, as emphasised by Aguinis and Solarino (2019) and Maher et al. (2018) trustworthiness based on methodological rigour and transparency is essential. The trustworthiness of qualitative data will, therefore, lie in the rigour with which the study is conducted.

Even though dealing with qualitative data is a subjective process, the data handling and management processes need to satisfy the demands of trustworthiness. Trustworthiness is

achieved when the researcher has managed to thoroughly and comprehensively demonstrate how well the research process was conducted so that the consumer of the research can have trust in the process (Rawhani, 2023). One attempt to achieve transparency when reporting qualitative research entails providing details of the research methods, context, findings, analysis, and interpretation (Sirwan, 2024), however, these elements may not necessarily guarantee trustworthiness but only aid in providing a thorough and transparent account of how the research was conducted to enable the consumers of the research to evaluate if trustworthiness was achieved. Transparency in the reporting of research to achieve trustworthiness can be achieved by demonstrating the elements of credibility, transferability, dependability, and confirmability. These elements are discussed in detail, showing how each was integrated into the data process.

Credibility

Research findings are considered credible when the situation or phenomenon being studied in a qualitative study is observed over an extended period, applying various methods of observation and data collection to validate findings (Ahmed, 2024; Stahl & King, 2020). According to Sirwan (2024), to achieve a high level of rigour. Adopting a sound methodology is essential in ensuring the credibility of the results. In this case, the mixed methods approach was opted for. This method provides rigour as it allows the researcher to combine qualitative and quantitative methods in the research process. The results of the qualitative phase were built into the data collection process in the quantitative phase, although this is not triangulation in the true sense of the concept, but provides an opportunity to cross-reference the findings across the two methods.

The researcher should keep an open mind and attitude when they conduct their observations, while keeping their biases from influencing how they interpret the observations. Conducting observations over an extended period works well when the researcher is aiming

for theory building within a grounded theory approach, as the researcher has the latitude of extended observational periods. In the case of this thesis, a longitudinal approach would not have been ideal since the purpose of the qualitative methodology was to set the basis for the quantitative analysis of the extent of the social value in the community. Nonetheless, a meticulous and systematic process of planning, data collection, and analysis was followed to ensure the credibility of the qualitative data collection and analysis process.

Transferability

The concept of transferability means that research results from one context can be applicable in an alternative context with similar circumstances (Ahmed, 2024; Stahl & King, 2020). However, given the subjective nature of qualitative research, it would be unfair to expect results to be replicated by a different researcher. However, the objective should not be to allow other researchers to replicate the results of previous research; the objective of transferability should be to provide adequate and succinct information about how the research is conducted to allow for its proper critique (Ahmed, 2024). To achieve the transferability of the results of this research, a detailed discussion of the methodological approaches, sampling procedures, and the process followed in conducting the interviews is clearly articulated in the preceding chapter (Chapter 2), which followed theoretical guidelines supported by the UREC procedures.

Dependability

Dependability is achieved when the results can withstand the test of time (Ahmed, 2024). This can be achieved by keeping records of the research material (Anney, 2014), which can be used at a later stage to audit the research process. Other methods to ensure dependability include the stepwise replication procedure (Anney, 2014). This procedure involves two researchers analysing the data separately and comparing the results. The methodological design for this thesis may not allow for such an approach; however, the results of this study will be compared to other similar studies conducted in the field.

The code-recode strategy involves taking a break after coding and returning at a later date to re-code the same data and compare the results (Anney, 2014). This process was applied during the coding of the qualitative data, where the researcher took a three-month break after completing the first coding round and returned to code the same transcripts. Some additional codes were discovered during the recording; however, these did not add to the already-formulated strands and themes. The dependability of the result was thus achieved through the code-recoding process.

Confirmability

Confirmability refers to the confirmation that the results presented in a study are not made up by the researcher but follow logically from the data analysed (Anney, 2014), in other words, the results can be corroborated and confirmed by other researchers, confirming that the researcher did not extract what s/he was looking for despite the result pointing to different findings. The concept of subjectivity, as discussed earlier in this chapter, suggests that confirmability may be an abstract concept in the case of a qualitative study, as it may be difficult to separate the researcher from the research process. Be that as it may, for research results to meet the standards of confirmability, they should be as close as they can be to objective reality. This can be achieved by allowing peers to examine the research, whereby the results of a study are presented to a group of scholars who critique the research and offer insights that will assist in a deeper reflection and enhancement of the processes that can be used to aid confirmability.

In summary, each of the elements discussed is essential to achieving the trustworthiness of the research result. In conducting this research, the researcher has meticulously applied himself and followed guidelines stipulated in the UREC procedures while taking guidance from literature and previously conducted research in this field. Extra care was taken to ensure that the results of this study met the criteria of trustworthiness.

Confirmation of Trustworthiness

This thesis focused on strengthening the trustworthiness of the qualitative data by ensuring high credibility in the collection and analysis of the data. During the research planning phase, it was envisaged that a random sampling approach would be adopted to ensure representation of the community. However, as the research process matured and material conditions were considered, a purposeful sampling approach was deemed appropriate. A decision was taken to target heads of households in the Carnarvon area. The justification for targeting heads of households is that, due to their family leadership role, they are at the cutting edge of the socioeconomic structure. They are the figures who are at the forefront of provision as they are expected to provide for their families, take care of them and ensure their safety. This places the heads of household in the coalface of societal existence and survival; hence, they are considered to carry relevant knowledge and experiences that will strongly contribute to this study. A total of 48 heads of households were sampled and interviewed.

Limited time was available to conduct interviews in the area; this was determined by the available resources to provide lodging and travel in Carnarvon during the data collection process - all the interviews were conducted prior to any analysis taking place. A randomised identification of samples in the different residential areas in Carnarvon was conducted using an online random sampling applet. This was done to ensure that a balance of views from all the residential areas in Carnarvon is registered; however, it should be emphasised that the primary sampling technique remained purposive sampling, which purposefully targeted heads of households in Carnarvon. Some interviews lasted less than an hour, and some lasted slightly more than an hour. All the interview recordings were transcribed and analysed using a manual coding process. The coding strategy focused on identifying words, phrases, and expressions that can be classified under a set of predetermined categories representing each of the social value determinants identified in the literature review. The coding continued until no new or

unique phrases could be identified. The constant comparison approach was applied to classify the strands that formed the themes.

The analysis process assumed a deductive thematic approach, intending to extract sufficient information to support the theoretically postulated social value elements. The thematic saturation point was reached at 58% of the transcripts. After the initial saturation was reached, a few more transcripts were further analysed a few months after the initial analysis was done, this was to ensure that the researcher brought a fresh look at the scripts without the influence of the codes that had already emerged. To ensure that the researcher's biases do not influence the coding process, the coded file was set aside for three months while the researcher performed other duties not related to the research. After three months, the same transcripts were analysed again, and the researcher found that the same strands were being identified. A few more transcripts were sampled from those that were not analysed after saturation was reached, and it was found that the strands found in five more transcripts did not produce new categories. This confirmed that saturation was reached.

This approach was based on the understanding that in a qualitative approach, the goal is to obtain in-depth knowledge of the phenomenon being studied rather than aiming for representativity of the population; data saturation is, therefore, one way of ensuring in-depth data collection (Guest et al., 2020; Subedi, 2021). Usually, a researcher aiming for data saturation will collect a few samples of data and analyse the data to identify strands and themes. The process continues with batches of data collection and analysis until no new themes emerge (Fusch & Ness, 2015). However, in this case, it was not feasible to collect data in smaller batches and continue the analysis while data collection continued. This is because the researcher needed to travel to the research focus area, just over a thousand Kilometres away from his residence, and stay over while collecting the data. To save on travel and accommodation costs, compounded by the fact that the researcher needed to utilise annual

leave days to be away from work while collecting data, the most cost-effective approach was adopted.

The process followed in the collection and analysis of the qualitative data in this thesis is aligned with the proposals of Ahmed (2024), Sirwan (2024), and Stahl and King (2020) of keeping an open mind, recognising one's personal biases, and persistently observing to attain a reasonable level of credibility for the results.

Reliability and validity of data

Reliability

Reliability in quantitative data deals with two aspects: population representability on the one hand, and consistency of the instrument (Golafshani, 2003). A concept closely related to reliability is validity, which deals with the accuracy of the instrument in measuring exactly what it is intended to measure (Golafshani, 2003). Surucu and Maslakci (2020) make the point that, although reliability and validity deal with different aspects of an instrument, there is a high likelihood that a valid instrument will be reliable. Still, the opposite may not necessarily be true. This means that validity should be placed at a higher level than reliability. To ensure that the survey instrument used in this study meets the conditions of criterion validity, which is the commonality of instruments in the area of research (Heale & Twycross, 2015), a Likert-scale instrument adapted from the Self-Efficacy scale was used. The reliability of the General Self-Efficacy instrument has been confirmed in prior research (Heale & Twycross, 2015). The scale adapted for this research contained six items, each with five subitems rated on a 5-point scale. The 5-point scale was chosen to strengthen the scale's internal reliability. Although the questionnaire is based on a tried-and-tested Likert instrument, its validity still needs to be ascertained, as the original instrument was modified and adapted. The Cronbach's alpha coefficient, which measures the consistency of items measuring the same construct (Croasmun

& Ostrom, 2011), was used to ascertain the internal reliability of the instrument. A larger alpha value shows a high degree of correlation among items measuring the same construct; a value of .70 is the ideal minimum (Tavakol & Dennick, 2011).

The questionnaire was piloted on a sample of 15 individuals who did not become part of the main data collection. The data were first collated in an Excel spreadsheet, where it was first cleaned up by visual inspection. Once the researcher was satisfied that the data were correctly captured, they were transferred into PSPP, where the validity tests were run. The overall reliability rating of the instrument was found to be 0.88, indicating high internal consistency. This rating is consistent with the rating for the self-efficacy scale, which was found to range between .76 and .90 (Bajpai & Bajpai, 2014). The individual α-scores of each of the items are depicted in Table 1; each item was found to have high internal consistency. The reliability test results are shown in Appendix A. Given that in all cases, all the items included were in agreement, no item was deleted.

Table 2

Reliability test results for the survey questionnaire

Survey Item	**Construct**	**Cronbach's Alpha (α)**
Item 1	Improved Living Conditions	.83
Item 2	Effective Stakeholder Engagement	.92
Item 3	Dignity	.92
Item 4	Ethics and Integrity	.75
Item 5	Inclusivity	.94
Item 6	Ubuntu	.94

In Table 2, the Alpha values show the internal consistency of the research instrument to be very high. A Cronbach's Alpha of 0.7 is considered good; however, Cheung et al. (2024)

emphasise that 0.7 indicates modest reliability; excellent reliability should be aimed at 0.8. The instrument thus displays a comfortable level of reliability as all the items scored far above 0.7.

The reliability of the data was further strengthened by the data-cleaning process. SPSS functionalities were used to check for missing values, detect data entries outside the defined scale, and check for duplicates.

Validity

The validity of the instrument is concerned with the accuracy of an instrument in measuring the construct that it is intended to measure (Surucu & Maslakci, 2020). For instance, if an instrument that intends to measure behaviour contains items related to attitudes, it will not be valid since its results will provide information about attitudes and not behaviour. This means that, critically, on the one hand, the content of the instrument should measure all the aspects of the construct under consideration, while on the other hand, it should measure exactly the intended construct. These elements are referred to as content and construct validities (Heale & Twycross, 2015), respectively. As this research adopted a sequential mixed-methods approach, the content of the survey instrument was shaped by the outcome of the qualitative constant comparison analysis process.

The coding process yielded 20 themes that were further consolidated into six distinct themes that were built into the categories of the survey questionnaire. Appendix B shows the grouping of the subthemes into the distinct themes that were used in the questionnaire. The themes that were measured in the survey constitute what the respondents consider to be their social value. These factors are highly considered as determinants of the state of development in the area. The purpose of the survey was to gauge how prevalent these elements are in the community and to get information about the prevalence of social value. The instrument was, therefore, considered valid as it was based on the content that would assist the researcher in obtaining information about the status of social value in the community of Carnarvon.

Results

This thesis adopted a sequential exploratory mixed-methods design (Dawadi et al., 2021). It is sequential because qualitative data is collected first, followed by quantitative data. It is sequential because the quantitative data collection depends on the results of the qualitative data analysis. The qualitative approach explores the nature of social value as described or viewed by the people of Carnarvon, followed by a quantitative approach that seeks to gauge the extent of the identified social value as implemented by the SKA project in the area. This is a three-phased approach where the first phase involves qualitative data collection and analysis. In the second phase, the outcomes of the qualitative data analysis are built into the quantitative data collection tool. This becomes the first integration point at which the qualitative results inform or determine the quantitative process. The third phase involves the second point of integration, where the two sets of results are brought together to formulate integrated conclusions (Dawadi et al., 2021).

The results of this study will thus be presented in a sequential approach, presenting the qualitative results first, followed by the quantitative results. Thompson (2017) used a similar approach when reporting the results of an explanatory sequential mixed methods study investigating issues of leadership in nursing management. Although slightly different from the approach in this thesis, Thompson's mixed methods approach was explanatory. In contrast, this thesis adopts an exploratory approach; however, the principles and approach in terms of the sequence in which the results are presented are similar. Thompson reported the results in two separate sections of the thesis in two separate chapters, starting with the results of the quantitative phase in Chapter 5 of the thesis, followed by Chapter 6, which reported the results of the qualitative phase, culminating with Chapter 7, which focused on the analysis and integration of the results. Alony (2015) and Boyde (2015) have also adopted similar approaches

in studies within the same field. The work of these researchers will be used as a guide in the approach and structure of presenting the results.

Qualitative Results

The Coding Process

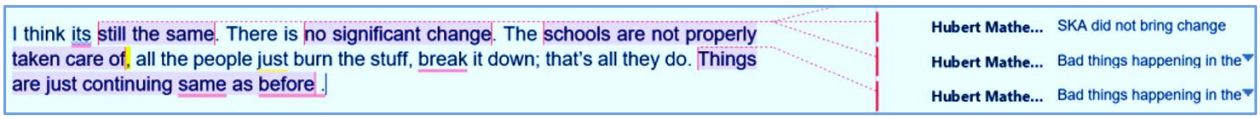
The transcripts of the interviews conducted with the community of Carnarvon were analysed using the constant comparison method. The relevant research question to be answered through this process was "What is the nature of the social value expected by the people of Carnarvon from the SKA project?" The coding process followed the deductive approach, as described by Leech and Onwuegbuzie (2011) and Moore et al. (2026). In this approach, the researcher develops predetermined themes and searches for confirmation from the data. According to the theoretical definition of social value developed in Chapter 3, the work of Di Domenico et al. (2010) was used to support the notion that the core of social value is found in the implementation of societal interventions that disrupt the current conditions to bring about positive change. This means that in every sector where there are socioeconomic interventions, the community should be left in a better state. The coding process will uncover the specific aspects that are considered relevant to yield positive change in Carnarvon. The philosophical standpoint of the humanist integrated into social entrepreneurship approaches enables the preservation of human dignity and the recognition of human worth. The embedded principles within this philosophy include aspects of consultation, ethical leadership and an environment that protects vulnerable groups; these are essential for the attainment of social value. These elements will form the basis for the coding process, where specific codes supporting the existence of these elements will be identified.

Furthermore, arising from Coleman's theory of social capital, which sees social capital as the glue that brings individuals and communities together on an equal footing, is the element

of inclusivity. If social value is to be achieved through a collective social capital process, inclusivity should be the glue that binds the social actors together. The theoretical review further proposed that social value accrues when elements that constitute the well-being and flourishing of individuals, such as health, decent work, and quality services, are inclusive of every member of the community (Di Domenico et al., 2010; Vázquez-Maguirre, 2020). The coding process was conducted to uncover specific elements coming out of the interviews with households in Carnarvon, relevant to their context, that are considered to facilitate and promote social value.

The researcher meticulously scanned the transcripts to identify statements within the text of the interview transcripts related to any of the factors identified. The first step involves reading through the transcripts and using different colours to highlight relevant text. The few extracts below show examples of the relevant texts identified as codes. Extract 1 shows text from an interview with a 48-year-old woman who has lived in Carnarvon since birth. When asked if she thinks the implementation of the SKA has brought about any positive change in the community, she expresses the sentiment that "*There is no significant change…things are just continuing the same as before*".

Extract 1



This sentiment agrees with the theoretical postulate that social value should be about changing the current situation; however, the respondent feels there are no signs of social value since there is no change. Strands with identification tags were developed under which strong statements similar to the one identified in Extract 1, carrying or expressing similar sentiments, will be grouped. The respondent statement was coded under the strand allocated to the identification tag "SKA did not bring change."

In Extract 2, a 29-year-old lady comments about the scarcity of jobs. She blames the SKA for not providing employment opportunities to the community. Still, contrary to the previous respondent, she does not feel that the conditions in the town are bad, and she feels that it is safer living among the people.

Extract 2

> The Town is small and feels safe to be among people who know you. The town has a feeling of security. What I don't like is the leadership that fails us. There are few jobs here.

The sentiment expressed here is that of positive change, but it highlights a deficit in one of the requirements of social value, which relates to Di Domenico et al.'s (2010) notion of social value, which is predicated on dynamic resource creation as a function of the flourishing of individuals. The availability of decent work becomes one of the necessary resources essential for the attainment of social value. If development efforts are not able to provide employment opportunities, the community would not acknowledge nor be satisfied with the development taking place in the community. The lack of jobs would mean that there is no flourishing due to the lack of employment opportunities. This statement was coded under the strand of "Dissatisfaction with Socioeconomic development of SKA"

Extract 3 brings a slightly different dimension of unfair treatment and favouritism when considering people for opportunities related to the socioeconomic initiatives of the SKA project. This brings into sharp focus the notion of inclusivity; the respondent feels that they are being excluded from the value-creating opportunities in the town since "*you need to know someone*" and it is "*just the SKA people who get ahead*". This sentiment suggests that there may be social value being created in the community; however, it is not inclusive. The statement identified in extract 3 is coded under the strand "unequal opportunities"

Extract 3

> The SKA has influence. There is very little that the SKA does for the town. Many people feel threatened, For example, you need to know someone and it is just the SKA people who get ahead.

Another respondent, in Extract 4, expresses views along the lines of inclusivity or the lack thereof, but she takes the argument further to suggest that some people are excluded as a result of unethical practices. She says "*only the connected will get jobs*", suggesting that there may be employment opportunities created through the implementation of the SKA project; however, not everybody is benefiting due to "*corruption*". A new strand, "unethical behaviour", was created to accommodate this statement.

Extract 4

> The SKA has promised jobs and they put people in charge but those people are doing corruption because only the connected will get the jobs. The SKA is willing to give opportunities to people but the people put in charge are corrupt. The community liaison promised to talk to the SKA but no response has come yet.

The process of identifying key phrases, words, and expressions in the interview transcripts that relate to the theoretical definition and key elements of social value yielded 20 different strands (Annexure B). Strands with codes that express related sentiments were grouped to form themes. The code "*a whole lot of people that lost their jobs due to the farms that were sold"* initially classified under the strand "negative development", expresses a sentiment related to negative change that is impacting the availability of jobs and general dissatisfaction with the developments in the area. Similarly, the code "*I feel like business is done. So, after the competition, after the conclusion of the competition, things changed afterwards, after the lady who did the competition left. I am not satisfied with what has happened*" was classified under "unfair treatment". However, a deeper analysis reveals that the sentiment being expressed here is that of frustration, as the respondent was shortchanged after

he won a competition, but instead of receiving the prize, the rules were altered to favour someone else. Without expressly stating it, the respondent highlighted issues of ethics, corruption, and treating some community members with disdain. The strands with these codes were then collapsed together into a new strand. The process of collapsing the broader strands into a crisper classification. The codes were further analysed to classify the underlying sentiment behind the statements representing the codes.

To further illustrate the framework of analysis, a few extracts are provided below, and an explanation of their categorisation is provided. A statement such as, "*I would really appreciate (it) if they could build playgrounds and house(s) for the poor people in the squatter camps"* seems to suggest that the respondent is concerned about the living conditions of the people in the informal settlement, otherwise known as squatter camps, however, upon a deeper analysis of the context within which this statement was made, it would appear that the concern being expressed here is that of equal opportunities and treating all community members the same. There could be a perception of discrimination among the different settlements. It was discussed earlier that the area of Carnarvon is divided into three types of settlements, demarcated according to the socioeconomic status of the residents. A common approach that stems from the old dispensation in South Africa is to undermine and look down on the poor, as this was the approach of the apartheid policy. The sentiment coming out of this statement could be related to a form of discrimination that tends to treat the poor people in the informal settlement as less important.

A further example is the statement, "*Carnarvon is going backwards*" which would appear to suggest a lack of development in the town of Carnarvon, a further reflection on the context within which the question was answered reveals that the respondent was expressing frustration that the development which is taking place does not affect or improve his condition and that he was not being consulted in the implementation of the programmes, given that this

respondent comes from the informal settlement area, the statement could further indicate that the respondent is feeling a sense of neglect due to the area he occupies in the community. Although development is there, the respondent interprets it as going backwards because he may not be benefiting.

Another example is the statement, "*The fact that there are meetings but there is nothing to them*." This statement touches on two critical issues that are closely related to the process of developing social value in a community. The respondent acknowledges that stakeholder engagement meetings are being organised and attended by community members; however, it goes further to highlight the critical issue of the true meaning of engagement. The respondent observes that there are no follow-ups to the meetings being held, possibly implying that promises or undertakings agreed to in the meeting are not being fulfilled. This talks to honesty and integrity, which were identified as one of the key principles of humanism. The first part of the statement was coded under the strand dealing with community engagement, and the latter part of it was classified under the strand that deals with ethics, honesty, and integrity.

Applying the deductive approach, the extracted codes were examined to find relationships between the sentiments encapsulated within the responses and the theoretically developed model of Social Value. For instance, the following seven strands: placing hope in the SKA, SKA did not bring change, dissatisfaction with the socioeconomic development of SKA, sense of safety, business opportunities, negative economic impact, and changes in the community, collectively express sentiments related to impactful change that is grounded within approaches that advance the worth of community members. Collectively, these sentiments express either the lack of impactful change, its inadequacy, longing for some form of impact in their immediate circumstances or advancing proposals on how impact can be achieved. The elements were codified into an encompassing thematic classification labelled "Observing the Worth of Human Beings (OtWoHB)".

Similarly, all obtained strands were regrouped into distinct themes (Table 3) that mirror the six theoretically developed determinants of social value. The five other themes that emerged were named Effective Stakeholder Engagement (CE), Dignity (DG), Inclusivity (Inc), Ethics and Integrity (E&I) and Ubuntu (U). The sets of codes representing a specific theme were reduced to statements that represent measurable contextual factors. The collection of Social Value determining factors (themes) and the statements representing the measurable contextual factors under each theme are shown in Table 3. Table 3 forms the basis and input into the survey questionnaire to be used in the quantitative leg of this research.

Table 3

Coded Themes and Supporting Sub-Themes

Social Value Determinant	**Measurable Contextual Factor**
Observing the Worth of Human Beings (OtWoH)	Many people are getting employed; Quality of life has improved; increased number of community projects; SKA improving the lives of people; without SKA life in Carnarvon would be worse.
Effective Stakeholder Engagement (ESE)	SKA Staff consults with the community; Views of community members are considered; Community members are free to express their views; the community is proud of community programmes; SKA has improved the lives of people.
Dignity (D)	The conditions in town have improved; there is improvement in services; people are benefiting; SKA is

Social Value Determinant	Measurable Contextual Factor
	helping to improve conditions; Community programmes bring dignity to the people.
Ethics and Integrity (EI)	There is trust in the SKA staff; staff are ethical and have integrity; People are free to discuss their needs with staff; staff are always honest and open; equal treatment for all.
Inclusivity (I)	People feel respected when interacting with SKA staff; community programmes are relevant to the needs of the community; community programmes add value; people are happy with all programmes implemented; there is a feeling of safety in Carnarvon.
Ubuntu (U)	SKA staff have Ubuntu; staff always consult all community members; staff treat all people with dignity; staff act with honesty and integrity; all groups are treated equally.

The left-hand column in Table 3 depicts the humanism-based theoretical determinants of social value. These elements were pre-determined based on the analysis of the humanism framework developed earlier in the thesis, combined with the corresponding social entrepreneurship approach. The right-hand side column depicts the factors that were uncovered in the Carnarvon community in the context of the SKA socioeconomic development programme. The theorised relationship between the determinants and the contextual factors was developed and represented in the Structural Equation Model shown earlier in Figure 3. The

next section will present results that validate the social value model, test the presence of social value in Carnarvon and estimate the extent of its prevalence.

Quantitative Results

The quantitative leg of this thesis aimed to examine the extent to which social value prevails in the town of Carnarvon as a result of the implementation of the SKA project. The qualitative process uncovered specific measurable elements, applicable to the Carnarvon context, that could be used to determine the presence of social value as defined by the people of Carnarvon. These measurable elements resonate with the theoretical disposition of social value as constructed through the theoretical framework of this thesis. The survey was designed to investigate the extent to which the contextual elements identified within the Carnarvon community as important to them are prevalent.

The analysis of the results will follow three interconnected strands. The first strand will use a disjointed Partial Least Squares (PLS) Structural Equation Model to estimate and validate the Social Value model. The second strand will test each of the hypotheses listed below:

$H0_1$ – There is no improvement in the living conditions of the people in the town of Carnarvon due to the implementation of the SKA project socioeconomic development programme.

$H0_2$ – The implementers of the SKA project do not interact well with the community of Carnarvon.

$H0_3$ – The implementation of the SKA socioeconomic programme does not uphold and preserve the dignity of the people of Carnarvon.

$H0_4$ – Socioeconomic programmes of the SKA implemented in Carnarvon are inclusive of all the people of Carnarvon.

$H0_5$ – The implementers of the SKA socioeconomic initiatives are unethical and do not have integrity.

$H0_6$ – The relations between the community and the implementers of the SKA project are not good and do not follow the principles of Ubuntu.

The third and final strand of analysis will estimate the extent of social value in Carnarvon.

Quantitative Data Collection Approach

Survey design: The survey was designed to test the presence of the factors that were identified to constitute the social value, which originates from the themes shown in Table 3. The theme relating to upholding the worth of human beings will be tested by the respondents' views on the factors that relate to people getting employed, improving the quality of life, and the presence of many community upliftment programmes being implemented. It was further necessary to determine if these factors, in case they are present in the community, can be attributed to the SKA project; hence, the last two factors relate to the SKA project in the area. The factors were scored 1 to 5 on the Likert Scale to test the level of prevalence in the community. This item on the questionnaire relates to sub-hypothesis 1.

The second theme, which relates to community engagement, was tested with the factors related to consultations between the SKA staff and the community, how the views of the community are considered, and the extent to which community members are free to express their views. To further assess how involved the residents are in the programmes that are being implemented in the community, a question related to how the respondents take pride in the programmes and also to determine if the programmes can be attributed to the SKA programme, two factors testing those angles were included. This item is related to sub-hypothesis 2.

The third theme relates to upholding and preserving the dignity of the people. The presence of dignity-preserving measures was tested with the following factors: improved conditions in the town, improved services, and people benefiting. The confirmatory factors

related to how the SKA is helping to improve conditions, and if the community feels that the programmes bring them dignity. This theme is related to sub-hypothesis 3.

The fourth theme relates to inclusivity. This is to test if the programmes that are being implemented in the community are not discriminating against any group of people. To test this theme, questions on respect during interactions with SKA staff, the relevance of the community programmes, and whether the community feels that the programmes are adding value to their lives. This theme is related to sub-hypothesis 5.

The fifth theme relates to ethics and integrity. To test if the community feels that the implementers of the SKA project have integrity and are conducting themselves ethically, the following aspects were incorporated into the questions in the survey under the ethics and integrity theme: trust, if people are free to discuss their needs with the SKA staff, if staff are honest and open and if there is equal treatment for all. This theme is related to sub-hypothesis 4.

The last theme relates to the protection of vulnerable groups and also touches on the issue of Ubuntu. Ubuntu as a determinant of social value was included as a necessary imperative within the African context, as it is believed that the basis for the implementation of any service delivery and increasing value in a community should be predicated on the values of ubuntu. Based on the theoretical disposition of humanism and the ontology of social entrepreneurship, protecting vulnerable groups is more of an act of ubuntu than a requirement for the accrual of social value in a community. The questions related to this theme were structured around factors of the staff having ubuntu, consultation with the public, treating all people with dignity, staff acting with honesty and integrity, and treating all groups equally. This theme is related to sub-hypothesis 6.

The survey questionnaire consisted of six items emanating from the themes developed during the qualitative phase. Each of the items is measured by using five positive statements

that represent the factors constituting each item. Each statement was rated 1 to 5, with 1 representing strongly agree, 2 representing agree, 3 representing neutral, 4 representing disagree, and 5 representing strongly disagree. The mean of each set of factors shows the degree of prevalence of the item.

Survey Instrument: The survey instrument was designed as a 5-point Likert scale adapted from the Self-Efficacy Scale. The instrument was divided into six sections, each representing one of the sub-hypotheses of this thesis. The hypothesis statement was structured to represent the dependent variable. The independent variables are the social value factors that were identified during the qualitative process. The factors were represented by positive statements where the respondents were required to indicate their level of agreement or disagreement with the statements. The scores representing the level of agreement or disagreement were analysed to make inferences about the hypothesis statements.

Sampling: The sampling procedure targeted individuals who have participated in the SKA socioeconomic development programme. The local SARAO office provided a list of 320 people who participated in the programme; however, about 160 of them were not traceable. The office provided various reasons for not being able to trace the individuals, including lost contacts, relocation to unknown locations and whereabouts simply not known. The researcher was able to locate and contact 155 individuals who gave consent to participate in the study. The available population for this study was therefore considered to be 155 participants of the SKA socioeconomic development programme.

The SKA socioeconomic programmes include the Schools Support Programme, Technical Skills Training Programme, Farm Workers Programme, SMME Development and Support Programme, a Community Development Grants Programme, a Creative Crafts Initiative, and a Science Open Days initiative. This was a homogeneous population as it relates to individuals with similar experiences of their interaction with the SKA socioeconomic

programmes. The questionnaire was distributed to 155 respondents. Most of them were reached in person as they resided in Carnarvon. The questionnaire was distributed in their homes and workplaces, while others were requested to collect it from the SARAO community engagement office, which is situated in the town of Carnarvon. This was an easier way to distribute and collect the questionnaire since the office is centrally located and within walking distance from the furthest place within the community of Carnarvon.

Non-responses: Non-responses were considered to be the questionnaires that were not fully completed or had multiple responses in a single line. Other questionnaires did not have responses in the demographic sections, and others did not confirm consent by marking the relevant box. These were also considered non-responses and invalid.

The number of valid responses obtained from the sample of 155 respondents who returned the questionnaire was 118, giving a response rate of 76%. Taherdoost and Madanchian (2024) observed that the response rate across many fields ranges between 32% and 56%, as such, the response rate of 76% obtained in this regard would be considered to be more than adequate. However, Sabol et al. (2023) makes it clear that it is not desirable for sample adequacy in Partial Least Squares Structural Equation Modelling to be judged by the sample size, but should be justified against the statistical power required to detect the hypothesised effects. The Structural Equation Model approach being considered in this regard requires a minimum sample of approximately 92 observations to detect a medium effect size ($f^2 = 0.15$) at a significance level of 0.05 with statistical power of 0.80, as prescribed in Cohen (1992). This, then, provides confidence that the sample size in this regard will not significantly constrain the results.

Demographics

The surveyed population (N=118) is almost entirely (93.3%) Coloured, with extremely low numbers of White (1.7%) and black (3.4%) respondents. The age distribution is almost

even across the age groups, with a slightly higher concentration in the 26 – 36 age group (19 – 27%). As expected, based on the recent census, there were fewer elderly people and youth (elderly, 55-80 = 15.3% and youth, 18-25 = 16.9%) as compared to middle age groups (26-35 = 27.1%, 46-55 = 21.2%, and 36-35 = 19.5%). There was an almost equal distribution of males and females, with a 10-percentage point difference (male = 44.9%, female = 55.1%).

Table 4

Distribution of Race in the Sample

Race	Frequency	Percentage
Black	4	3.4
White	2	1.7
Coloured	110	93.2
Other	2	1.7

Table 5

Age distribution in the sample

Age Group	Frequency	Percentage
56-80	18	15.3
46-55	25	21.2
36-45	23	19.5
26-35	32	27.1
18-25	20	16.9

Table 6

Gender distribution in the sample

Gender	Frequency	Percentage
Male	53	44.9
Female	65	55.1
Total	118	100

Disjoint Two-Stage Partial Least Squares Structural Equation Analysis

To analyse the data, a Partial Least Squares Structural Equation Modelling (PLS-SEM) analysis approach was adopted, following the disjoint two-stage approach. This approach was considered suitable as it allows for the operationalisation of the reflective-formative higher-order structural model adopted in this thesis, as recommended by Becker et al., (2012). The approach is further recommended for its effectiveness when dealing with small samples, as is the case in this regard.

The analysis followed a structured PLS-SEM approach involving data preparation, model specification, estimation, and evaluation of both measurement and structural models. The use of bootstrapping provided robust statistical inference, while the results were interpreted in alignment with both empirical findings and theoretical considerations. The first stage of the disjointed two-stage analysis process involved estimating the first-order latent constructs using their respective context-specific indicators as uncovered from the qualitative process. The results of the first stage are shown in Table 7.

Table 7

Internal Consistency, Reliability and Convergent Validity

Construct	Cronbach's Alpha (α)	rho A	Composite Reliability (CR)	AVE
ESE	0.906	0.908	0.931	0.729
D	0.915	0.925	0.938	0.754
EI	0.886	0.906	0.918	0.696
I	0.930	0.932	0.948	0.784
U	0.914	0.916	0.936	0.746
ILC	0.891	0.901	0.920	0.700

Internal consistency reliability was assessed using Cronbach's alpha (α), rhoA, and composite reliability (ρC). As presented in Table 7, all constructs exceeded the recommended threshold of 0.70 across all three measures. Cronbach's alpha values ranged from 0.886 to 0.930, while composite reliability values ranged from 0.918 to 0.948. These results indicate a high level of internal consistency among the indicators measuring each construct.

Convergent validity was assessed using the Average Variance Extracted (AVE). All constructs reported AVE values above the recommended threshold of 0.50, with values ranging from 0.696 to 0.784. This confirms that each construct explains a substantial proportion of variance in its indicators, thereby establishing convergent validity.

Discriminant validity was assessed using the Heterotrait-Monotrait ratio (HTMT). The HTMT matrix is shown in Table 8.

Table 8

Discriminant Validity (HTMT Matrix)

Construct	ESE	D	EI	I	U	ILC
ESE	—					
D	0.848	—				
EI	0.916	0.992	—			
I	0.946	0.808	0.904	—		
U	0.951	0.859	0.896	0.991	—	
ILC	0.919	0.913	0.946	0.851	0.881	—

The HTMT values in Table 8 reflect a high degree of correlation between several constructs, with values above the 0.9 recommended threshold. The strong internal relatedness

of these constructs will be assessed within the theoretical construction of Social Value modelled as a second-order formative construct.

In Stage 2, Social Value (the second-order formative construct) was formed as a composite of the six first-order construct scores using bootstrapping to ensure robust statistical outcomes. The results are shown in Table 9.

Table 9

Structural Equation Model Bootstrapping

Construct	Weight (β)	T-value	Factor loading (λ)	p-value
ILC	0.214	21.756	0.920	0.000
ESE	0.176	28.151	0.930	0.000
D	0.177	24.652	0.908	0.000
EI	0.181	30.409	0.942	0.000
I	0.164	28.982	0.918	0.000
U	0.170	28.964	0.928	0.000

The bootstrapped weights were all positive and statistically significant ($p < 0.001$), with t-values far exceeding the recommended threshold of 1.96. Improved Living Conditions ($\beta = 0.214$) emerged as the strongest contributor, followed by Ethics and Integrity ($\beta = 0.181$), Dignity ($\beta = 0.177$), Effective Stakeholder Engagement ($\beta = 0.176$), Ubuntu ($\beta = 0.170$), and Inclusivity ($\beta = 0.164$). All indicators demonstrated strong and significant loadings, ranging from $\lambda = 0.908$ to $\lambda = 0.942$.

These presented results address the appropriateness of the structural equation model while providing information on the theoretical framing of Social Value around its determinant factors. The next section will address the hypothesis and shed light on the existence of Social Value in Carnarvon.

Hypothesis Testing

The survey used in this study consisted of six items, each related to a theoretically developed construct that is understood to form social value. Each of the constructs, in turn, is linked to a mean-level inferential hypothesis as developed earlier in this section, as shown in Table 10.

Table 10

Hypothesis - Social Value Determinant Construct Matching

Construct	Hypothesis
Improved Living Conditions (ILC)	$H0_1$–There is no improvement in the living conditions of the people in the town of Carnarvon due to the implementation of the SKA project socioeconomic development programme.
Effective Stakeholder Engagement (ESE)	$H0_2$–The implementers of the SKA project do not interact well with the community of Carnarvon.
Dignity (D)	$H0_3$–The implementation of the SKA socioeconomic programme does not uphold and preserve the dignity of the people of Carnarvon.
Inclusivity (I)	$H0_4$–Socioeconomic programmes of the SKA implemented in Carnarvon are not inclusive of all the people of Carnarvon.
Ethics and Integrity (EI)	$H0_5$–The implementers of the SKA socioeconomic initiatives lack ethics and integrity.

Construct	Hypothesis
Ubuntu (U)	$H0_6$–The relations between the community and the implementers of the SKA project are not good.

To confirm the adequacy of the sample, a post hoc statistical power analysis was conducted using the observed coefficient of determination ($R^2 = 0.785$) obtained from the structural model, and the corresponding effect size (f^2) was calculated as 3.651. The six predictor variables were considered with a sample size of 118 and a significance level of 0.05; a statistical power of approximately 1.00 was obtained. This substantially exceeds the recommended minimum power of 0.80, indicating that the sample size was more than adequate to deal with the hypotheses.

The hypothesised population mean ($\mu_0 = 3$) represents the neutral midpoint of the Likert scale used in the study. This value serves as a benchmark to determine whether respondents' perceptions of the SKA socioeconomic development programme are significantly positive or negative. A series of one-sample t-tests was conducted to determine whether respondents' perceptions of the SKA socioeconomic development programme differed significantly from the neutral midpoint ($\mu_0 = 3$). The results are shown in Table 11.

Table 11

One-Sample t-Test Scores

Construct	Mean (M)	t	df	p-value	Decision	Interpretation
ILC	2.85	-1.33	117	0.185	Fail to Reject $H0_1$	No significant improvement
ESE	2.73	-2.42	117	0.017*	Reject $H0_2$	Significantly positive

Construct	Mean (M)	t	df	p-value	Decision	Interpretation
						community interactions
D	2.94	-0.48	117	0.630	Fail to Reject $H0_3$	Dignity not significantly upheld
I	2.75	-2.20	117	0.030*	Reject $H0_4$	Significant inclusivity of community members
EI	2.94	-0.57	117	0.568	Fail to Reject $H0_5$	Not significantly ethical
U	2.73	-2.44	117	0.016*	Reject $H0_6$	Significantly good relations

Note: N=118. Test Value (μ_0). Two-tailed tests were conducted. Significant results (P<.05) are indicated with an asterisk (*)

The results revealed that the mean scores for all constructs were below the neutral value of 3, indicating an overall negative perception of the programme. However, statistically significant differences were observed for Effective Stakeholder Engagement (ESE) (M = 2.73, p = 0.017), Inclusivity (I) (M = 2.75, p = 0.030), and Ubuntu (U) (M = 2.73, p = 0.016). These findings suggest that respondents perceived stakeholder engagement, inclusivity, and community relations were considered to be significantly adequate.

In contrast, Improved Living Conditions (ILC) (M = 2.85, p = 0.185), Dignity (D) (M = 2.94, p = 0.630), and Ethics and Integrity (EI) (M = 2.94, p = 0.568) did not differ significantly from the neutral midpoint. This indicates that while perceptions of these constructs were slightly negative, they were not statistically distinguishable from neutrality.

Accordingly, the null hypotheses were rejected for H02, H04, and H06, and not rejected for H01, H03, and H05.

Frequency Analysis

The last level of analysis involved running frequency tests to determine the percentage of respondents who agreed with the postulates regarding the contextual factors. The tests were conducted for each social value category, and the results are presented in the respective tables below. To make meaning of the response frequencies, the results of those who agreed and strongly agreed were combined to give a collective percentage of agreement.

Category 1: Improved living conditions.

Table 12 shows the results of the frequency analysis related to the first category of contextual factors giving rise to the social value determinant related to the living conditions in Carnarvon. Five contextual factors were tested. The majority of respondents (58%) agreed with the postulate of the first contextual factor, that more people are getting employment. Conversely, only 39% believe that the quality of life has increased. The responses on the other three contexts were moderate, with almost half the respondents agreeing with the propositions of each item: increased number of community upliftment programmes (49%), the SKA has improved the lives of people in Carnarvon (43), and without the SKA, life would not have improved (41).

Table 12

Percentage agreement with Item 1: Improved Living Conditions

Contextual Factor	Frequency of Agreement (%)
Increased employment opportunities	58
Improved quality of life	39
Increased number of community upliftment programmes	49
SKA has improved the lives of people in Carnarvon	43
Without the SKA, life would not have improved	41

Category 2: Effective Community Engagements

The results of the frequency analysis in the second category of contextual factors aligned with community engagement as a social value determinant are shown in Table 13. This category deals with the interactions between the SKA staff and the community and how these interactions could help entrench Social Value in the community. Five contextual factors that determine appropriate stakeholder engagement were tested. The majority of respondents (55% and 52%, respectively) agreed that there are effective consultations by the SKA staff with the community, and that they are free to express their views. A slightly lower number of respondents (48% and 49%, respectively) believe that their views as community members are considered, and they are proud of the SKA community programmes. SKA project has improved the lives of Carnarvon residents. An even lower percentage of respondents (42%) agreed that the SKA project has improved the lives of Carnarvon residents.

Table 13

Percentage Agreement Item 2: Effective Community Engagement

Contextual Factor	**Frequency of Agreement (%)**
Effective SKA consultations with the community	55
Views of the community are considered	48
Community members are free to express their views	52
Community members are proud of the SKA community programmes	49
The SKA project has improved the lives of Carnarvon residents	42

Category 3: Dignity

The results of the frequency analysis in the category of contextual factors associated with the preservation and upholding of the dignity of the residents of Carnarvon are shown in Table 14. The first contextual item was framed to test whether the living conditions in the town have improved since the implementation of the SKA project. Based on the information

extracted from the community during the qualitative process, it emerged that the community links their dignity with the state of their living conditions. The majority of respondents (53%) agreed that their living conditions have improved. Fewer respondents (43% in all factors) agreed with the postulates of the other four contextual factors: there is improved delivery of services, an increased number of people benefiting from SKA programmes, the SKA is helping to improve conditions in Carnarvon, and that community programmes bring dignity to the people.

Table 14

Percentage Agreement Item 3: Dignity

Contextual Factor	Frequency of Agreement (%)
Improved living conditions in Carnarvon	53
Improved delivery of services	43
Increased number of people benefiting from SKA programmes	43
SKA is helping to improve conditions in Carnarvon	43
Community programmes bring dignity to the people	43

Category 4: Inclusivity

The next category of contextual factors giving rise to the social value determinant associated with how the people of Carnarvon feel included in the activities related to the SKA Socioeconomic Development Programme is shown in Table 15. This social value determinant deals with the concept of inclusivity. This item tests whether the residents of Carnarvon are treated with the same courtesy irrespective of their background or status. A lower percentage of respondents agreed with all factors that tested inclusivity in Carnarvon. Fewer (43%) agreed that they feel respected when dealing with SKA staff, and another similarly lower percentage (43%) agreed that community programmes are relevant to the needs of the people. A slightly

higher percentage, but still in the minority (46% and 48%, respectively), agreed that the community programmes implemented in Carnarvon add value and that they are happy with all programmes being implemented. A much lower fraction (39%) of respondents agreed that they feel free to discuss their needs with SKA staff.

Table 15

Percentage Agreement Item 4: Inclusivity

Contextual Factor	Frequency of Agreement (%)
Feeling respected when dealing SKA staff	43
Community programmes are relevant to the needs of the people	43
Community programmes add value	46
I am happy with all programmes being implemented	48
There is a feeling of safety in Carnarvon	32

Category 5: Ethics and Integrity

The next social value determinant presented in this section concerns the ethics and integrity of SKA staff working with the community in Carnarvon. The results of the frequency analysis in this category are shown in Table 16. Respondents who agree that the SKA staff implementing socioeconomic programmes in Carnarvon are ethical and act with integrity, and those who agree that the community programmes being implemented in Carnarvon add value to them are in the majority (52% in each case). Only half (50%) of the respondents agree that there is trust in the SKA staff implementing the socioeconomic programmes in the town, while those who agree that they always feel free to discuss their needs with SKA staff and those who agree that the SKA staff always treat all residents equally were in the minority (39% and 40%, respectively)

Table 16

Percentage Agreement Item 5: Ethics and Integrity

Contextual Factor	Frequency of Agreement (%)
There is trust in the SKA staff implementing the socioeconomic programmes in the town.	50
Staff implementing socioeconomic programmes in Carnarvon are ethical and act with integrity	52
Community programmes add value	52
I always feel free to discuss my needs with SKA staff	39
The SKA staff always treat all residents equally	40

Category 5: Ubuntu

The last social value determinant deals with the concept of Ubuntu. This concept was explained extensively in previous sections in this thesis, and the rational of including it as one of the social value determinants in this context was also widely canvassed. The results are shown in Table 17. Respondents who agree that the SKA staff working in Carnarvon always act with ethics and integrity, the SKA staff always treat everybody with dignity, and that the staff of the SKA have Ubuntu were in the majority (52%, 51%, and 51%, respectively). However, fewer respondents (38% and 48%, respectively) agreed that the staff of SKA always consult with the public when they want to do things in the town and that all groups are treated equally.

Table 17

Percentage Agreement Item 6: Protection of Vulnerable Groups (*Ubuntu)*

Contextual Factor	Frequency of Agreement (%)
The staff of the SKA have Ubuntu	51
The staff of SKA always consult with the public when they want to do things in the town	48

Contextual Factor	Frequency of Agreement (%)
The SKA staff always treat everybody with dignity	51
The SKA staff working in Carnarvon always act with ethics and integrity	52
All groups of people are treated equally by the SKA staff	38

Evaluation of Findings

The analysis of the qualitative data sought to answer the first research question, which had an interest in the nature of the Social Value as defined by the people of Carnarvon. The analysis uncovered key salient items that define the Social Value in Carnarvon. The theory of social entrepreneurship-based humanism postulates that several factors come together to build social value in a community. One of the factors in the list is the concept of stakeholder engagement. Meaningful stakeholder engagement based on joint interests affirms the dignity of the people, which is one of the ingredients for building shared value (Camargo & Vázquez-Maguirre, 2021). The respondents expressed views related to the need to consult with the community, the need for the community's views to be considered, and the need for community members to express their views freely.

In the same vein, the respondents mentioned statements that indicate their pride in the community development programmes and the role of the SKA project in improving their lives. The sentiments that emerged from the analysis align with the theoretical postulate that puts stakeholder engagement and consultation at the centre of social value, which invariably results in community members being proud of the programmes implemented in their community.

The second Social value forming theoretical construct relates to recognising and considering the worth of the people of Carnarvon and how they are treated to safeguard their humanity as worthy community members. The principles of humanism dictate that the value of the individual should be recognised and prioritised. This means that when interacting with individuals on the ground, the focus should be on genuine upliftment rather than using upliftment as a means to the organisation’s end goals. Based on Vázquez-Maguirre’s (2020)

approach to humanism, which this theory relies heavily on, adopting a human-centred approach as an organising philosophy guarantees the achievement of an organisation's objectives, including economic objectives. Consistent with this view, the people of Carnarvon expressed their need to be considered as worthy by the SKA project, and this should be evident through the availability of jobs that will improve their quality of life while uplifting their community. The prevailing views in the community are that these elements will help improve people's lives while also improving community conditions.

The next element of social value identified through the theory of humanism relates to actions that uphold and maintain the dignity of individuals. In broad terms, the Kantian Theory says that dignity is a universal golden norm underpinning human interactions (Hanna, 2021). It therefore goes without saying that, within the principles of humanism, upholding and preserving the dignity of community members will contribute to strengthening social value among the people. The respondents express their desire for the preservation of their dignity through the implementation of dignified community programmes that improve services. Improving the provision of services is key to ensuring that the living conditions in the area are fit and appropriate for human settlement.

Inclusivity is another element that emerged from the theoretical review as a determinant of social value. The literature review uncovered that Indigenous communities, mostly people of colour, have histories of being marginalised and treated as sub-humans. In South Africa, the policy of separate development was institutionalised as a government policy called Apartheid. Under the Apartheid system, there were separate rights and privileges for the natives, designated as Black, and the settlers, designated as Europeans. After Apartheid was defeated and democracy was installed in 1994, the country embarked on a journey of reconciliation, reconstruction, and redress.

Furthermore, the literature review found that scholars such as Camargo and Vázquez-Maguirre (2021), Della Lucia et al. (2021), and Yang et al. (2020) advocate for humanistic management approaches that are alive to the inclusion of marginalised and disadvantaged groups. This way of organising is essential in the Karoo, which consists of previously disadvantaged groups. The sentiments expressed by the respondents related to the need for inclusion are that they need to feel respected, implement programmes that are relevant to all, and bring value to the community at large, as opposed to a select few. These sentiments show that the respondents are not overly concerned by the lack of inclusivity but are sensitive to the possibility of being overlooked when programmes are implemented.

The literature review also identified integrity and ethical conduct as key to achieving sustainable social value. The work of Vázquez-Parra et al. (2022) demonstrated that ethics and integrity are essential antecedents of social value in a social entrepreneurship-based humanistic management environment. Statements like "they came with so many promises, "…to form parties for job creation…", and "you need to know someone", and even the word "corruption" were thrown into the mix, suggesting that the people are concerned about the ethical conduct of those who are responsible for spearheading their development.

Lastly, the concept of protecting vulnerable groups also emerged during the interviews. The extent of the literature reviewed in this thesis shows that the primary concern of humanism is the protection of vulnerable groups such as indigenous people, women from disadvantaged communities, impoverished African communities, the youth, and people with impairments

In line with the theoretical postulates, the respondents expressed concerns about "working with the Municipality to get the children out of trouble. " This shows that the community sees the protection of the children as part of creating social value. The salient sentiments pointing to the need to protect vulnerable groups were that there must be equal opportunities for all, which can be achieved through collaboration. This theme ties in closely

with the concept of inclusivity and shows that a collective approach is essential for the creation of value. This theme ties in closely with the concept of inclusivity and shows that a collective approach is essential for the creation of value.

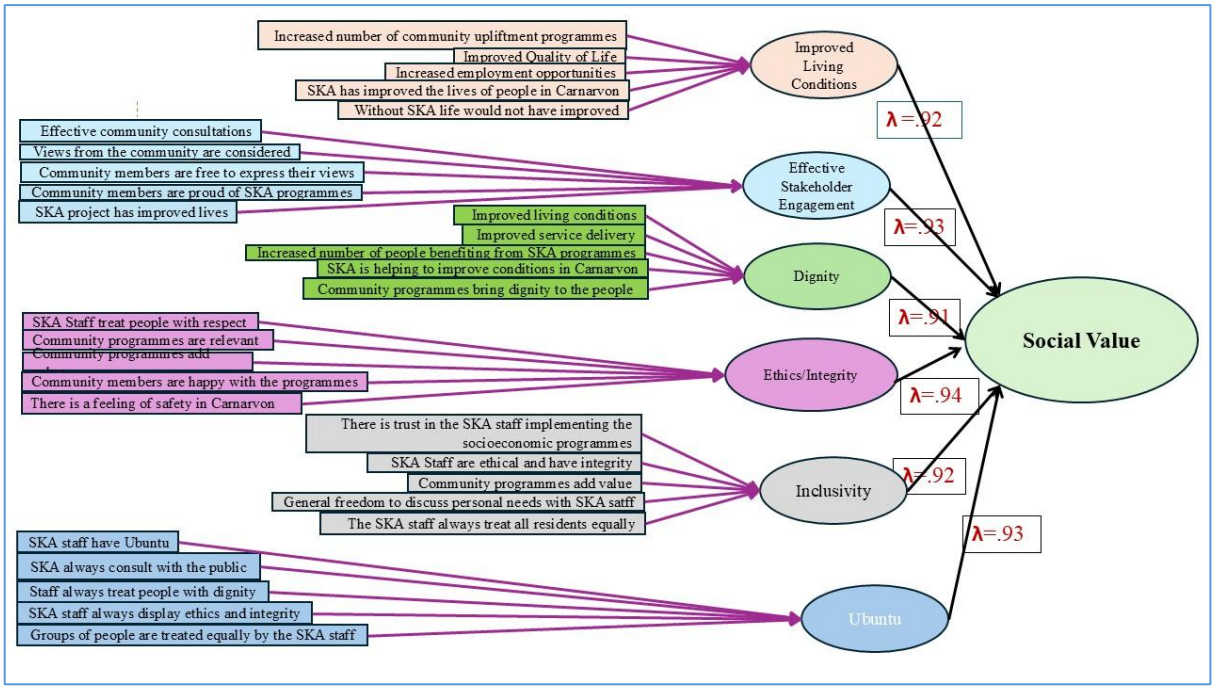
Linking the Qualitative Results to the Quantitative Approach

This thesis constructed a Social Value model based on the philosophy of Humanism. The theoretical approach proposed that applying humanistic principles within a social entrepreneurship environment has the potential to develop Social Value. It should be emphasised that the envisaged ontological structure of social entrepreneurship is one in which its pursuits are focused on the delivery of social value as the fundamental objective, as opposed to the pursuit of economic profits. This approach aligns with the nature and objectives of large scale science infrastructures such as the SKA project. Although the fundamental pursuits of these projects are the advancement of the science research enterprise, they have a natural mandate and a lateral obligation to deliver Social Value in the communities within which they operate. It is within this realm that this thesis proposes that large scale science infrastructure projects apply the humanism based model to incorporate the delivery of Social Value in their business operations.

The Social Value model (Figure 3) proposed a theoretical link between contextual factors and latent factors that form social value. The qualitative process identified the specific contextual factors in the Carnarvon area that give rise to each of the social-value-forming elements. This process completes the Social Value model in terms of plugging in the testable factors within the Social Value chain. The model was subsequently validated using the disjointed Partial Least Squares (PLS) Structural Equation Model test. The confirmed model of Social Value is shown in Figure 5.

Figure 5

Confirmed Structural Model of Social Value



In Figure 5, the contextual factors identified during the qualitative process are depicted by the rectangles at the entry level of the model (Level 1). At level 2, we see the theoretically formulated elements which were found to form Social Value. The loading of each factor into Social Value is shown along each connecting arrow, represented with the symbol lambda (λ).

A one sample t-test was performed to evaluate the extent of the Social Value as per the validated model. Each Social Value factor was tested against a hypothesised quality related to its prevalence in the community. Overall, as indicated earlier in the presentation of results, it was found that there was a significant deficiency of elements that form Social Value within the SKA Socioeconomic Development Programme.

The measurement model itself exhibited sufficient internal consistency properties. The Cronbach's Alpha tests ranged between 0.884 and 0.928 on all six first-order constructs. The six dimensions were highly inter-correlated (0.746 to 0.915), suggesting they are closely related yet distinct facets of the higher-order construct. When modelled formatively, each dimension

contributed equally (approximately 16.67%) to the formation of Social Value. This balanced contribution strongly supports the theoretical model in which Social Value emerges from the collective presence of improved living conditions, effective stakeholder engagement, dignity, ethics/integrity, inclusivity, and ubuntu. The overall Social Value construct explained 100% of the variance in its operationalisation ($R^2 = 1.000$), which is expected when the higher-order construct is a direct composite of its lower-order dimensions. The very high correlations between each first-order construct and the second-order construct (0.907 – 0.933) provide robust empirical support for the structural equation model. The mean score of Social Value was 2.82 (SD = 1.25) on a 5-point scale, indicating a moderate level of perceived Social Value in the studied context. The next section outlines how the specific factors come together to explain the extent of Social Value in Carnarvon.

The extent of Social Value in Carnarvon

Six hypotheses, each aligned to a determinant of Social Value, were formulated. The Social Value model was tested using the PSL-SEM and bootstrapping techniques, and it was found that the theoretically postulated determinants of Social Value are in agreement with the model where they are framed as collectively giving rise to Social Value. The implication thereof is that the collective presence of the determinants in Carnarvon implies the presence of Social Value; similarly, a deficiency in any of the factors implies a deficiency of Social Value. The presence of the determinants is verified against the hypothesis.

Observing the Worth of Human Beings. The aspect of observing the worth of human beings as a component of social value was tested against the first hypothesis, which postulated that the implementation of the SKA Socioeconomic Development Programme in Carnarvon would have brought about significant improvement in the living conditions of the people in the

town, thereby intrinsically affirming their worth as human beings. The null hypothesis in this case could not be rejected, showing that, on the whole, the people of Carnarvon believe that their living conditions have not significantly improved.

The results of the frequency analysis on each contextual factor confirm the likelihood that living conditions may not have improved. Although the majority of respondents recognise that the presence of the SKA project in Carnarvon has contributed to increased job opportunities [*Increased employment opportunities* (58%)]. The increased opportunities for employment could be associated with the increased number of socioeconomic intervention programmes being implemented in the area. A substantial percentage of respondents, although slightly below 50%, agreed that more programmes are being implemented [*Increased number of community upliftment programmes (49%)*]. Even though the people of Carnarvon agree that they have seen more jobs being available and more socioeconomic intervention initiatives being implemented, they still could not associate these positive developments with an improvement in their living conditions, and do not believe that without the SKA, their lives would have improved. This scenario provides deeper insights into the nature of social value impact in the area.

The majority of the respondents believe that the SKA hasn't significantly altered or improved their lives; hence, their quality of life has not improved despite having more job opportunities and seeing more socioeconomic development opportunities.

The data acquired and analysed in this thesis would not be able to offer insights into the reasons for the lack of improvement in the quality of life; however, the prevalence of social value within a community should be accompanied by a significant improvement in the quality of life. In the same vein, the deficiency in a single sub-element of social value may not necessarily suggest that there is no social value at all; the complete picture encompassing all the social value determinants should be considered.

The theoretical framework setting the relationship between social value and humanism holds that upholding and preserving the worth of human beings is one of the key factors within the humanism philosophy that is crucial for the attainment of social value. The results show that, firstly, the people of Carnarvon strongly believe that their worth as human beings needs to be upheld through the implementation of the SKA project. Secondly, the results show that the worth of the people has been upheld through the provision of employment opportunities. It should be noted that, even though this is the case, the people believe that their quality of life has not increased, which has a significant impact on the nature of Social Value as it exists in the area.

***Engaging Stakeholders*.** The component related to stakeholder engagement was tested against the second hypothesis, wherein the null hypothesis postulated that the implementers of the SKA project do not interact well with the community of Carnarvon. The null hypothesis was rejected in this regard, implying that there are significantly positive interactions between the SKA staff and the community. The frequency results support the finding that there are effective community engagements in Carnarvon. However, the respondents still believe that even though the community engagements are positive, they are free to express their views, and to some extent, the community members are proud of the SKA community programmes, they still believe that the SKA project hasn't improved their lives, buttressing the findings related to the first determinant of Social Value.

Considering the views of stakeholders in a consultation programme cuts deeper into the heart of stakeholder engagement. Binneman & Davis (2021) showed that a stakeholder engagement process becomes successful and delivers desired results when it assumes an engagement approach as opposed to a management approach. Engagement means that the stakeholders are onboarded as part of the decision-making process. The results in this

component suggest that the SARAO staff effectively engages with the community, in line with Binneman & Davis' (2021) findings that the SKA project has transitioned into a more engagement approach as opposed to a management approach.

The acceptance by the respondents that there are community engagements, while in the same vein not confirming strongly that their views are being considered, presents a slight problem. One would expect that in a positive community engagement environment, the views of the people will be heard and considered; however, these findings present a rather strange situation. One may need to further examine the nature of the stakeholder engagement to understand the deficiencies that result in the community not appreciating them.

Looking through the lens of Mokhohlane's (2023) findings, where a dichotomous situation was encountered, where the community could not recognise the development being claimed by the implementers of the Big Science projects in the Astronomy reserve in South Africa, Carnarvon included. The dichotomy is reflected in these results, where the community fails to acknowledge the positive effects of community engagement. Perhaps these results point to a disjointed approach to Social Value, which leaves the recipients of it yearning for more impact, which restricts their full recognition of some of the positive developments.

According to Freeman et al. (2018), management from a stakeholder perspective means that value is created by all stakeholders as a collective. Management should work with and for the people to create value that is embraced and appreciated by the people. As such, the sub-hypothesis that the implementers of the SKA project interact well with the community of Carnarvon is a critical factor in the formulation of Social Value. Furthermore, most of the literature reviewed in this thesis identified stakeholder engagement as a key element in addressing the issue of social value and impact delivery. Butler (2018) and Ha-Duong et al. (2016) specifically mentioned effective stakeholder engagement as one of the solutions proposed to counter the social issues identified within the relational dynamics of Big Science

initiatives and local communities. This is central and key to the general improvement of the delivery of social value by the Big Science initiatives. The importance of stakeholder engagement was also emphasised by Binneman and Davis (2021), advocating for a shift from a stakeholder management approach, which is characterised by a top-down approach in decision making that affects the community, and urging Big Science implementation to transition to a stakeholder engagement approach, which is based on consultation and collective decision making. This approach was found to have improved the work done by the SKA project in Carnarvon and enabled it to make progress in implementing a number of community intervention programmes. The fact that the views of the community members are not considered means that the stakeholder consultation process does exist but may not be effective, thereby not contributing to the development of Social Value as envisaged in the earlier developed Social Value model.

***Restoring and Protecting the Dignity of Individuals*.** The Social Value determinant related to the restoration and protection of the dignity of the people was tested against Hypothesis 3. The null hypothesis postulated that the implementation of the SKA upholds and preserves the dignity of the people of Carnarvon. The null hypothesis could not be rejected, suggesting that the dignity of the people of Carnarvon was not sufficiently upheld and protected. The core principle of humanism is centred around recognising the individuality of people as having intrinsic dignity by virtue of being human beings. The deficiency in upholding the dignity of the people in Carnarvon invariably speaks to the inadequacy of Social Value. The frequency results suggest that the majority of the respondents believe that their living conditions in the town of Carnarvon have improved; however, the high p-value ($p = 0.630$) indicates that the perceived improvement in the living conditions alone is not sufficient to bring about a sense that the dignity of the people is being upheld, hence the perceptions of improved

delivery of services, increased number of people benefiting from SKA programmes, the SKA helping to improve conditions in Carnarvon and the community programmes bringing dignity to the people were on the minority, reinforcing the finding that the dignity of the people of Carnarvon has not been upheld.

The concept of human value is closely linked to human dignity. Etinson (2020) defines human dignity in terms of honouring people's social status, irrespective of their socioeconomic standing. It follows logically, therefore, that an individual will feel less valued if their status in society is not recognised and honoured; as such, the contextual factors tested in this category play a pivotal role in determining how the dignity of the people is preserved and, by extension, how Social Value is entrenched. The results in this section show that the element of dignity in Carnarvon has not contributed to the development of Social Value in the area.

Inclusivity. The concept of inclusivity is central to the construction of social value within a society. Coleman's theory of social capital, which explains the nature of and approach to value-creating social entrepreneurship, calls for a collective approach to addressing social problems on an equal footing. It calls for inclusiveness where all members of the social entrepreneurship effort combine their efforts on an equal footing, where the rights, needs, and interests of everyone are considered.

This category was investigated against hypothesis 4, which postulated that Socioeconomic programmes of the SKA implemented in Carnarvon are relevant to the people of Carnarvon. The idea of relevance is introduced in this category from the understanding that interventions meant for a specific group of people can only be relevant when those people are included in the decision-making on those activities. This concept is more relevant in the South African context, where inequality is high, and this happens within a historical social context where certain groups of people were considered unworthy and overlooked for opportunities.

The null hypothesis was rejected, implying that the residents of Carnarvon believed that there is adequate inclusivity in the implementation of the SKA socioeconomic development programmes in Carnarvon.

However, the outcome of the frequency analysis paints a different picture. The percentages of respondents who agreed with the survey propositions related to how the socioeconomic development programmes of the SKA are inclusive were lower in all the contextual factors. Only a lesser percentage could agree that they feel respected when dealing with SKA staff, the community programmes implemented in Carnarvon are relevant to their needs, and that they add value. An even much lesser number of respondents, only 39%, agreed that they feel safe in Carnarvon. It should be noted that the majority of the respondents who participated in the survey, over 93%, are from the coloured community; as such, this may suggest strongly that the coloured community is being excluded from the benefits of the SKA socioeconomic development programme.

Ethical Conduct, Integrity, and Honesty. The survey category examining the extent of ethical conduct, integrity, and honesty is related to Hypothesis 5. The null hypothesis postulated that the implementers of the SKA socioeconomic initiatives are unethical and do not have integrity.

The null hypothesis could not be rejected, thereby suggesting that the implementers of the SKA project could be unethical and lack integrity. This finding is not surprising considering the sentiments that emerged from the interviews, which contributed to the construction of the Social Value theme of integrity. During the interviews, some participants used the word “corruption” to describe some of the actions attributed to the SKA staff. Corruption describes the highest form of unethical conduct; hence, it is not surprising that a similar finding is emerging on this leg of the analysis.

Further analysis reveals that the majority of the respondents trust the SKA staff implementing the socioeconomic programmes in the town, they believe the staff are ethical and act with integrity and agree that the community programmes implemented by the same staff add value to them as residents. These results do not accord with the finding that the people of Carnarvon believe the SKA staff are unethical. A further analysis could shed more light on the genesis of this disparity; however, both outcomes are useful in determining the status of Social value in Carnarvon when taken in totality, including the outcome of the qualitative process.

During the face-to-face interviews, some of the participants hinted at the possibility of favouritism existing within the SKA socioeconomic development programme, where opportunities are only allocated to certain groups of people. Thus, it is not surprising that the majority of respondents feel the staff working on the socioeconomic development initiatives of the SKA do not treat people equally, which speaks to their ethics and integrity.

Some deeper analysis outside the scope of this thesis could help to explain why the respondents still trust the staff and are free to discuss their needs with them while they don't think they are ethical.

The subject of ethics and integrity in the implementation of social entrepreneurship activities that are based on humanistic principles was discussed at length, drawing from the works of Beckmann et al. (2014), Bruder (2021), and Sengupta & Lehtimäki (2022). It was established that, for social entrepreneurship to give rise to social value, it should be based on genuine feelings of wanting to impact the individual within a society rather than the need to fulfil a mission. If sustainable value is to be achieved, the intervening approaches should be based on ethical and open interactions. The results in this category suggest that there may be positive actions being taken as part of intervening to address the plight of people in the area,

but the low levels of integrity and openness and the perceived discrimination threaten the nature of the social value that would be created.

Protecting Vulnerable Groups. The category related to the protection of vulnerable groups was tested against the sixth and last hypothesis. The null hypothesis postulated that the relations between the community and the implementers of the SKA project are not good. The items tested in the survey include examining the presence of the principle of Ubuntu and assessing the interactions between the SKA staff and the community to determine if there are considerations for vulnerable groups, particularly the previously disadvantaged and the severely marginalised. The null hypothesis was rejected, implying that there are good relations that speak to the principles of Ubuntu.

Within the African context, and specifically in the context of Carnarvon as a previously disadvantaged community, it is essential for staff tasked with the responsibility of interacting with community members in the delivery of socioeconomic opportunities to act with honesty and integrity as virtues demanded by the principle of ubuntu.

Ubuntu is an African concept that fosters togetherness and communal well-being by recognising that the well-being of the individual depends on the well-being of the whole (Nnodim & Okigbo, 2024). Ubuntu is the African version of humanism as it is based on moral principles that promote, among others, human dignity, social justice, fairness, respect, and collective justice. The government of South Africa has incorporated these principles into the public service space to help facilitate a smooth service delivery process that is inclusive of all citizens (Ferreira et al., 2007).

Social Value in Carnarvon

This thesis proposes that the presence of humanistic principles and social entrepreneurship approaches could facilitate the building of social value in a community. Since social value is not directly measurable, an effective method for assessing its existence in society would be to ascertain the extent to which those affected believe their social value exists. The SKA project is already implementing programs aimed at developing social value in Carnarvon; however, a question remains as to whether these programs are indeed delivering social value as intended. This thesis aims to partly determine the answer to that question.

The theoretical structure of Social Value was constructed and later tested to confirm its validity. The findings, thereof, are that the model positioning Social Value as a higher order construct that is formed by specific factors that are drawn from the humanism philosophy, combined with social entrepreneurship approaches, was confirmed and found to be valid.

The humanism-social entrepreneurship social value-forming factors were, in turn, understood to be arising from contextual factors derived from qualitative engagements with the community. These factors were tested through quantitative means to determine their presence in the community of Carnarvon so as to make inferences about the presence of Social Value. Although there was confirmation that the identified factors indeed collectively give rise to Social Value, it was further found that the factors do not account for a strong presence of social value. Furthermore, since Social Value is a composite entity arising from a collective of determinants, the absence of any one determining factor disrupts the presence of Social Value; similarly, strong evidence of the existence of one or two factors does not confirm the presence of Social Value.

Further analysis identified nuances in what the people of Carnarvon recognise as their prevailing socioeconomic disposition. For instance, in one case, the results show that the respondents believe that they are benefiting from an increase in the availability of employment

opportunities that are a result of the implementation of the SKA project, while on the other hand, there is a sense that the quality of life is not improving. It would be expected that the more people find work and derive income to take care of their daily needs, the better the quality of life will be, which is not the case in this context.

Similarly, in another case, the respondents indicated that there is effective engagement with the SKA staff. The rejection of the second hypothesis further supported this assertion. This is well and good, as it would suggest healthy relationships that are key to the construction of Social Value. Surprisingly, in one of the contextual factor tests, it was found that the majority of the respondents do not feel free to discuss their needs with the SKA staff. This is another surprising outcome, as it would be expected that when the relations are good, people would freely discuss their issues and concerns. These slight nuances point to the complex nature of social value. At the lower level, there are multiple configurations in relational dynamics among the reflective contextual elements forming the determinants of the Social Value; hence, the hierarchical nature of social value. The picture created here is that, for social value to hold, each set of contextual factors needs to hold for its higher order formative social value determinant. For instance, perceived ethical conduct during community consultations would not translate into perceptions of ethics when dealing with employment issues. Similarly, allowing residents to air their views during an open public consultation process would not translate into an overall perception of openness when other determinants of social value are at play. Another important factor to note is that, although the second order constructs in the social value model are reflective of the underlying contextual factors, they are not composite as such, meaning that a social value determinant can exist partially based on the strength of one or two of its formative indicators, but social value cannot exist without all its determinants being present. Only half of the social value factors tested were found to be present in the Carnarvon context, thereby confirming the outcome that social value was not prominent in the area.

Summary

The analysis of both qualitative and quantitative data in this study reveals the specific elements that the people of Carnarvon consider as constituents of their social value and further confirms that the SKA project has made significant progress in creating social impact through its Socioeconomic Development Programme; however, there are gaps in the design and implementation of the programme that hinder the delivery of social value.

The results inevitably lead to the learned assumption that the people of Carnarvon have not realised social value as they anticipated. These findings align with the notion, emanating from various studies within this field (Chitereka, 2022; Gastrow & Oppelt, 2018; Tiplady, 2024; Velho et al., 2024) that Big Science projects such as the SKA have a role to play in developing social impact within their localities, but they have not been able to quantify the effect.

Some of these studies explain this disparity on the basis of the misalignment of mandates and objectives. Mokhohlane (2023) uncovered empirical evidence pointing to the existence of this misalignment. In a study which employed a two-pronged approach, one approach focusing on the perceptions of development from the community's perspective found that there was no evidence of development or social impact attributable to the Big Science initiative (in his study, Mokhohlane refers to Big Science projects as Mega Astronomy Infrastructure Projects or MAIPS). The other leg looked at perceptions and conceptions of development from the project implementers' point of view and found that there was evidence of development. Mokhohlane could not explain this disparity. However, the approach and the outcome of this study may start to offer a plausible explanation.

According to the results of this thesis, the SKA project has made significant progress in developing social impact, hence Mokhohlane's finding that development exists from the project's point of view. The fact that this study further found that the community of Carnarvon

has not realised Social Value explains Mokhohlane's finding that there was no development from the community's point of view.

These findings speak to the issue of the dichotomy of developmental mandates, where the project implements development informed by its mandate, while the community expects development that responds to their social context. Chitereka (2022) explains this disparity in terms of global power dynamics and political developments. The dynamics of power and politics play at the interface of security, capability and power, which converge to determine the identity of a state. Identity needs to be proven, maintained and protected. Big Science initiatives have therefore been elevated as anchors of identity and power at a global level, more especially in African states. The pursuit of identity at a global level informs the focus of big science initiatives as tools for security, power and capability, thereby neglecting developmental issues at a local level. This thesis argues, however, that development should start at a local level, and the Big Science initiatives possess both the structural and international capability to play in that space, as shown in the SKA socioeconomic development programme.

CHAPTER 5: IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS

Introduction

Part of the mission of this thesis is to address the issue of misalignment in the understanding and approach to socioeconomic development from a Big Science perspective and the expectations of communities within which a Big Science project operates. Big Science projects often gain social legitimacy through their promise of local socioeconomic development, giving hope that their presence within the communities in which they operate will leave the local people in a much better social standing than before. However, most researchers have found that there is either no empirical evidence of such development or the development claimed by the Big Science project implementers is not aligned with the needs and expectations of the local people. The disjuncture often leads to project implementation problems associated with community unrest that disrupt and derail progress while leaving communities distraught and hopeless.

This thesis aims to bridge that gap and ensure that public-funded Big Science projects can deliver sustainable social value over and above their scientific mandate. This will ensure that government funds allocated to scientific projects also achieve the purpose of uplifting the socioeconomic conditions of local communities, particularly in economically depressed areas. The SKA project, implemented by the South African Radio Astronomy Observatory, a business unit of the National Research Foundation, an entity of the Department of Science, Technology and Innovation in South Africa, is used as the case study in this research project.

The research project followed a mixed methods approach, where a qualitative methodology was employed to determine the nature of social value as envisaged by the people of Carnarvon, a small town in the Karoo where the majority of the SKA activities are taking place and where the broader activities of the SARAO socioeconomic development programme

are based. A theoretical model of social value was developed and tested in the community of Carnarvon using an open-ended interview process. The focus of the interviews was to compare and evaluate the nature of social value in Carnarvon against the theoretically modelled approach to social value.

The views regarding social value that emerged from the qualitative process were packaged into quantifiable elements and tested in a survey to determine their prevalence within the community. The information obtained from the questionnaires was analysed through quantitative methods. The next section presents the implications of the research findings.

Implications

The first set of data, which was analysed through the constant comparison approach, sought to answer the first research question: What is the nature of the social value expected by the people of Carnarvon from the SKA project?

The results showed that the people of Carnarvon define their social value according to six elements. Namely:

The need to uphold their worth as human beings: The stories and narratives told during the interviews show that the people of Carnarvon believe that their worth could be upheld through job creation, improving their quality of life, implementing programmes that uplift the community, and improving their standards of living through proper delivery of services. There is a sense of hope and trust that the implementation of the SKA project has the potential to improve their lives through its socioeconomic development programme, which incorporates the elements responsible for the restoration of their worth as human beings.

Community engagement: The results showed that the representative sample of the community of Carnarvon believes that they should be sufficiently consulted by the SKA staff when implementing socioeconomic development programmes. There is a general sense that

consultation can lead to the success of the socioeconomic programmes, thereby increasing their positive response towards the SKA in general and the socioeconomic programmes specifically. They further expressed sentiments to the effect that consultations should be supported by an environment where they are free to express their views, and this will ensure they take pride in the programmes that are being implemented.

Dignity of the people: The participants in the qualitative interviews see their dignity as being embedded within aspects such as improved living conditions, improved services, and implementation of programmes by the SKA. In general, these items relate to the general living conditions in the town, as such dignity is closely tied to better living conditions.

Inclusivity: Inclusivity stems from the need to feel recognised and respected by people who hold some form of positional authority. This concept of inclusivity can be tied to the experiences of non-White South Africans during the Apartheid era. Black people were subjected to dehumanising treatment by the government at that time, such that the trauma of being treated as sub-human still lingers today. Any form of interaction that tends to suggest that some individuals or groups of individuals are more privileged than others is bound to trigger a sense of abjection. It is within this context that the dignity of the people of Carnarvon links their social value to how they are being treated by people in authority.

Ethics and integrity: The principles of ethics identified in the community include trust, openness, honesty, and equal treatment of everyone. Ethical behaviour also links to the elements of inclusivity and dignity discussed earlier. It takes true integrity and a strong ethical orientation to consider and treat people with equality, irrespective of their status, colour, or race. Dignity can only be upheld in an environment where ethical behaviour is the norm.

Protection of vulnerable groups: The concept of safeguarding vulnerable groups encompasses several key and significant principles identified in earlier discussions about social value elements. This aspect did not emerge directly from the conversations with the

interviewees but was inferred by the researcher based on the conceptual framework. This element includes aspects such as ubuntu, consultation, dignity, honesty, and equitable treatment of all individuals. Vulnerable groups in the Carnarvon area, primarily, would be the poor, unemployed, and uneducated. These groups of people would normally be classified as having low social status; there is often a strong temptation to dismiss these groups of people as non-entities in the community. When combined, the elements of social value identified earlier will ensure that all groups in the community are included in the program for developing social value.

Formulating Social Value

The elements outlined above constitute the social value of the people of Carnarvon. The objective associated with the first research question was to determine the nature of social value created by the SKA project as described by the people of Carnarvon. It must be noted that in answering this research question, the thesis does not investigate whether the identified social value exists or not; this will be addressed in the second research question. In keeping with the specific objectives of the first research question, the nature of the social value was uncovered. The results show that the people of Carnarvon believe that social value would be achieved by implementing the six determinants identified in the preceding section.

Based on the work of Di Domenico et al. (2010), the theoretical framework of this thesis establishes that social value is realised when there is a constant supply of resources to meet the needs of society. The needs of society, as established in the theoretical framework of this thesis from the work of Vázquez-Maguirre (2020), can be aggregated in terms of decent work, good health, low levels of inequality, and economic and environmental sustainability. However, social value is neither standard nor uniform across societies. The work of Sultan et al. (2018) and Jolliffe and Beer Prydz (2017) showed that the nature of social value in a specific society depends on the economic conditions endemic to the community; hence, it was essential to

determine the nature of social value in the Carnarvon society.

The findings on the aspects of social value in Carnarvon align with the theoretically postulated nature of social value. Although the aspects identified in this thesis relate to the SKA project and the area of Carnarvon, the intrinsic elements of social value creation would apply to similar Big Science initiatives in other areas, as they are theoretically developed and grounded in the literature. However, the determinants of social value in Carnarvon are area-specific, as they depend on prevailing socioeconomic conditions. For instance, entrenching social value by upholding people's worth is a universal approach within a humanistic environment; however, the specific intervention that would serve to uphold the worth of the people should be relevant to the local context – the availability of jobs in the case of Carnarvon. In a context where the availability of jobs is not an issue, the community could prioritise other elements to be responsible for people's worth as human beings.

These findings imply that humanistic management principles are key and central to realising social value in communities. The six elements identified in Carnarvon as the constituents of their social value are the same elements identified in the humanism literature as key in the restoration, promotion, and protection of human dignity. However, this thesis did not test or uncover evidence to suggest that the SKA had deliberately organised for humanistic management. As such, the results presented in this thesis do not suggest or imply that humanistic management principles are being applied in the implementation and management of the SARAO socioeconomic development programme. The next section will unpack the implications of the quantitative results with respect to the existence of social value in Carnarvon.

Extent of Social Value in Carnarvon

The second research question dealt with the existence of social value in Carnarvon and further gauged the extent to which the value exists. The extent or prevalence of the social value

will provide insights into its sustainability as evaluated against the UN Sustainable Development Goals. The specific research question is "to what extent has the social value, as defined and anticipated by the local community, been implemented in the local community?" Two statistical analysis methods were applied to gauge the extent to which the envisaged social value elements are prevalent in the area. The outcome of these tests was then used to evaluate the hypotheses.

Hypothesis 1. The implementation of the SKA has improved the living conditions in the town of Carnarvon. According to the humanism/Social Entrepreneurship theoretical model developed earlier in this thesis, improving the living conditions in a community contributes to the expected levels of social value in that community. This hypothesis postulated that the presence of the SKA project in Carnarvon would have helped to improve living conditions.

What came out of the analysis was that the people of Carnarvon accept that their living conditions have improved. Linking these results to the qualitative interviews, it was determined that the availability of job opportunities is one of the main considerations in terms of improving living conditions. The majority of respondents agreed that the SKA has created job opportunities for the people of Carnarvon. Humanism as a philosophical approach seeks to uphold the worth of human beings by putting their needs first, especially their right to flourish as human beings (Matheson et al., 2021). Therefore, it can be construed that the SKA implementation of socioeconomic programmes in Carnarvon lacks the fundamentals of humanism in its application and administration; hence, it is not able to uphold the worth of human beings.

The natural result of the deficiency in applying principles of humanism is that the worth of the people as human beings, the residents of Carnarvon, is not being upheld, as such many still believe that not enough has been done to improve their quality of life. It is important to

note that social value is associated with improved quality of life. The availability of employment opportunities and the implementation of community upliftment programmes by the SKA should contribute to the improvement of living conditions and the quality of life. It could be construed that the presence of these elements is either not sufficient to affect quality of life or is not implemented within a proper humanistic environment to do so. However, without venturing into the reasons for the non-improvement of the quality of life, the evidence proves that an essential outcome of social value, which is the improved quality of life, is absent in the community. Within the context of the SKA project as a big science initiative, it is accepted that it has created employment that would help improve the quality of life, but more still needs to be done from a humanistic perspective to reach a satisfactory level of improvement.

Hypothesis 2: The implementers of the SKA project interact well with the community of Carnarvon. This hypothesis tested the SKA staff's interactions and engagement with the community. From a social entrepreneurship perspective, stakeholder engagement ensures that the right decisions that favour the stakeholders, thereby minimising conflict and improving relations, are taken (Grama-Vigouroux et al., 2020; Sachs & Kujala, 2020). Taking and implementing collective decisions shows that the community is honoured and their status as legitimate participants in the social development process is fully recognised (Etinson, 2020).

The results in this regard show that there is sufficient community engagement, as evidenced by the fact that the staff entrusted with the SKA programmes are believed to consider the views of the people. This finding, taken with some of the sentiments shared during the qualitative process, where there were insinuations that some community programmes are delivered without considering the context and needs of the community members, may need to be interpreted with caution insofar as the presence of effective stakeholder engagement

recorded in this regard is concerned. In the case of the SKA project, for instance, programmes such as education support, provision of Wi-Fi services, and awarding bursaries for Mathematics and Science-related subjects do not resonate with the people of Carnarvon. Mokhohlane's (2023) findings buttress this point and call for a more effective stakeholder engagement process that genuinely considers the views, needs and aspirations of the local people when designing and implementing social value development initiatives.

Hypothesis 3: The implementation of the SKA project respects and upholds the dignity of the people of Carnarvon. The residents of Carnarvon feel that their dignity has not been restored, protected, and upheld. This was to be expected due to the overwhelming consensus that the living conditions in the town have not improved, as recorded in hypothesis 1. People are seeing an improvement in basic services delivery while they also acknowledge that they are benefiting from the socioeconomic programs implemented in the area, but such positive developments are viewed through the lens of dignity. Although it is not the responsibility of the SKA project to deliver basic services to the community, it was found during the interviews that many residents believe that the SKA has influence and also collaborates with the Municipality in the delivery of services. For instance, an SKA-related programme to clean and beautify the town was carried out. This could be one of the programmes that placed the SKA project within the service delivery realm.

The work of Etinson (2020), Hanna (2021), Camargo & Vázquez-Maguirre (2021), Vora and Kainzbauer (2020), and Yang et al. (2020), which forms the theoretical framework of this thesis, demonstrated that indigenous people and vulnerable groups, such as the poor, youth, and women, often fall victim to dignity affronts. Similarly, the studies by Odari (2020) and Ogo (2019) revealed that African societies are also culturally susceptible to dignity violations and lack humanistic approaches in their leadership styles. In this context, it is appropriate for the people of Carnarvon to demand social value based on the preservation of their dignity,

particularly because, as a poor indigenous community, they have experienced more dignity violations during the Apartheid era in the country. Therefore, the lack of sufficient humanistic approaches in the implementation of initiatives that improve the services may be the main stumbling block in the people of Carnarvon realising their dignity.

Hypothesis 4: The socioeconomic programmes of the SKA implemented in Carnarvon are relevant to the people of Carnarvon. The item of relevance is strongly related to the issue of dignity. It was shown that the people of Carnarvon identified dignity as one of the determinants of their social value because, as an impoverished black society, the community experienced dignity affronts during the apartheid era. The policy of apartheid was based on separate development for blacks, coloureds, and whites, with the former treated as subhuman. Reversing the injustices of the past means treating people with dignity and treating them equally without discriminating against any particular group. The majority of the respondents felt that the programmes implemented in their area were relevant to them, implying that they feel included rather than discriminated against. The prevalent feeling of inclusivity accords with the finding that the community engagements are effective, albeit the fact that there was a call for caution in accepting the effectiveness of the engagements; nonetheless, the presence of these interactions talks directly to the issue of inclusivity. Put together, these elements support the notion that the people of Carnarvon are being treated well by the SKA staff and that they are not discriminated against, hence, the programmes being implemented are relevant to them. This is a crucial aspect in terms of social value development since one of the principles of social entrepreneurship, based on James Coleman's theory of social capital, is that social value should be equitably shared among all participants. The high degree of inclusivity confirmed by the outcome in this category confirms the presence of another crucial social value-forming ingredient.

Hypothesis 5: The implementers of the SKA socioeconomic initiatives are ethical

and have integrity. The theoretical base of this thesis is grounded in the principles of humanism within a social entrepreneurship environment, and the main tenet is that applying these principles is bound to create social value. It was further shown, from the work of Beckmann et al. (2014), Bruder (2021), Sengupta and Lehtimäki (2022) and Wu et al. (2020), that the backbone of social entrepreneurship and, by extension, humanism is ethical conduct. Social entrepreneurship implemented without ethical conduct amounts to bad social entrepreneurship, which is not aligned with the principles of humanism; as such, it becomes bad social entrepreneurship (Bruder, 2021).

The results indicate that the people of Carnarvon believe the implementers of the SKA socioeconomic development programme are unethical and lack integrity. This view is supported by some responses during face-to-face interviews, where corruption was mentioned as a possibility.

The absence of ethics and integrity as the crucial elements of social value undermines the core objective of implementing the SKA socioeconomic development programme in the community. The lack of integrity and ethics leads to distrust and builds animosity, thereby making it difficult to achieve social value for the community.

Hypothesis 6: There are good relations between the community and the implementers of the SKA project. The concept of Ubuntu means that individuals are bound together as part of a society, guided by values and moral prescripts of togetherness and interdependency. Gade (2011) found that the concept of Ubuntu found traction in South Africa during the period of transition from Apartheid to the new dispensation. The idea was introduced as a constitutional imperative seeking to drive cohesion, forgiveness, and inclusivity in the previously deeply divided South African society (Fox, 2011). In this context, Ubuntu becomes necessary in facilitating good relations and, more especially, the protection of the vulnerable. It would be expected that where humanism is applied, Ubuntu will prevail since, in essence,

Ubuntu is African humanism. However, in this case, the absence of openness and honesty suggests that relationships are not as healthy as in any environment; healthy relationships are built with honesty and openness. The absence of yet another crucial ingredient of social value points to the deficit in the implementation of the SKA socioeconomic initiatives.

There is a sense that some people are being discriminated against. Sentiments suggesting discrimination and favouritism were aired during the oral interviews. The finding that the majority of the people felt that they were not being treated equally corroborates these sentiments. Unequal treatment of some people invariably creates tension and threatens the very creation of social value.

Linking Theory to Evidence

One of the key objectives of this study is to address the tensions that occasionally flare up on the ground in Carnarvon between the residents and the implementers of the SKA project by ensuring that delivery mandates are aligned. It is often believed that the standoffs that happen in the area are due to the slow pace of transformation and the opportunities provided by the SKA project. This notion is supported by various research studies, which found, among other issues, that the SKA project is unable to quantify the positive developments that it attributes to its implementation (Gastrow & Oppelt, 2018). There is a disjuncture between what the SKA views as development and what the residents consider to be positive development in their lives (Butler, 2018), and there's generally no direct evidence linking social developments of Big Science projects to improved lives of citizens at the local level.

Notwithstanding the lack of direct evidence of local socioeconomic development attributable to the SKA project, some studies were able to find pockets of positive development in the area. A study conducted by Urban Econ, commissioned by the government department responsible for the SKA project, found that there are positive developments in areas such as education, job creation, and economic development (Urban-Econ Development Economists,

2023).

Surprisingly, despite the pockets of positive socioeconomic development found in Carnarvon, the belligerence continues and seems to be gaining momentum at every turn. Now and then, there will be flare-ups of dissent and sometimes accompanied by violence. This suggests that the people are either dissatisfied with the developments or completely oblivious to any claimed development. This observation is supported by a recent study conducted by (Mokhohlane, 2023), which uncovered an interesting dichotomy where the ordinary citizens in the area are not acknowledging any positive developments attributed to the SKA, while on the other hand, the implementers of the project cite countless positive developments. It remains an interesting area of exploration to understand the genesis of this dichotomy. However, the outcomes of this study strongly suggest that the lack of meaningful consultation and engagement, the unethical behaviour of the staff and the general lack of Ubuntu may account for the dichotomy.

This study approached the problem from the perspective of the community. The approach was to determine if the purported socioeconomic development is of value to the local community rather than being of value from a national or international perspective.

The theoretical framework developed in this thesis showed that social value could be achieved by implementing specific developmental elements integrating humanism and social entrepreneurship. The empirical evidence emerging from the results of this investigation shows that the necessary elements required to support the development of social value are strongly prevalent in Carnarvon. The incongruity emerging from the physical reaction of the community members against the SKA project versus their reaction to the empirical testing of their reality and views about development in the area needs to be explored further, but the anti-social value factors uncovered in this study suggest that there could be equally strong factors that cause a tension between the possible development of social value and its anti-development on the other

hand. This could explain the negative attitudes and dissent against the SKA project.

For the purpose of this study, it would suffice to say that an environment conducive to the development of social value does exist in the area, and the SKA can rightfully take the credit. However, more work still needs to be done in structuring and organising the system to properly and effectively achieve sustainable social value for all community members.

During the face-to-face interviews, some respondents strongly expressed negative sentiments against the SKA and its activities in the area. A young Coloured male who didn't consent to being recorded but was willing to talk painted a picture of the SKA staff as unethical (*…but those people are doing corruption because only the connected will get the jobs*) and do not communicate well with the community (*Sometimes we don't know there is a meeting, I have never attended a meeting of the SKA*). Another respondent echoed similar sentiments, although expressed differently (*the town is deteriorating…we don't even know about the meetings. We don't get notice of them)*. Another female was very vocal about the lack of progress in the town (*They made many promises, but nothing has come of it. So, there is no progress).*

These sentiments, and similar others, express the nature of social value in the negative. For instance, ethics and open communication are theoretically construed as key elements of social value within the humanistic perspective; the corollary in the absence of ethical conduct and lack of openness would be the absence of social value, as was reflected in some of the responses that disagreed with the propositions of certain survey items such as "the increased quality of life" (44% disagreeing compared to only 35% who agreed), "SKA Staff working in this town are always honest and open to the people" (47%) disagreed compared to only 39% who agreed), and "all groups of people are treated equally by the SKA staff" (40%) disagreed compared to 38% who agreed). Proposals on how to build on the prevailing conditions to build sustainable social value will be discussed in a later section.

Sustainability

According to Elkington and Rowlands (1999), sustainability means achieving economic development that will endure into the future while keeping the environment and other social aspects intact. In the case of a Big Science initiative, socioeconomic sustainability means achieving lasting socioeconomic development while preserving local conditions. It should be noted that socioeconomic sustainability efforts are undertaken within the context of pursuing the natural mandate of the Big Science initiative. Kroll et al. (2019) argue that sustainability should be viewed from a systems perspective, where advancement of lasting economic development, social inclusion, and environmental stewardship is simultaneously pursued, with the SDGs as a guiding framework.

A contrasting argument from Eisenmenger et al. (2020) is that sustainability and economic expansion stand in direct contrast, as they view sustainability as a socio-ecological endeavour that demands the preservation of the integrity of the ecological ecosystem, which seems to be irreconcilable with the pursuit of economic advancement. They suggest that the SDGs are inadequate as beacons of sustainability, as they promote economic expansion without adequately addressing resource limits. This view aligns itself with the dimension of sustainability that has a strong focus on the environment. This dimension of sustainability calls for the use of natural resources and interactions with the environment to be approached in a manner that is sensitive to the continued existence of such resources for use by future generations. Another dimension of sustainability exists. This is related to socioeconomic sustainability, whereby corporations organise their business strategic models in such a way that they preserve the well-being of society (Missimer & Mesquita, 2022).

Sustainability in the context of this thesis aligns with the social dimension of sustainability; it adopts the approach that seeks to reconcile the two competing views, taking the position that sustainability can be achieved through the integration of the five pillars of

people, planet, prosperity, peace, and partnership as advanced in the 2030 Agenda for Sustainable Development (Sachs et al., 2019). Achieving sustainability calls for an integrated approach where progress in one pillar depends on and supports progress in the other pillars. The SDGs provide a platform for a holistic developmental approach and policy coherence.

Pedersen (2018) is of the view that organising a business model to align with the SDGs is beneficial to the business while allowing the business to provide solutions to the people based on their needs. The SDGs provide a framework for key interventions and actions that are necessary for sustainable socioeconomic development (Sachs et al., 2019). In Pedersen's (2018) view, engaging in SDG-focused activities not only benefits society but also yields economic benefits for the business. A similar argument can be made for Big Science projects, in the sense that building community intervention strategies around the SDGs will benefit both the Big Science Project and the community. A much stronger argument for the alignment of socioeconomic benefit programmes with the SDGs is that designed interventions will be relevant to the community, thereby addressing the issue of relevance and inclusion as part of the identified pillars of social value. Furthermore, both parties will be able to define and measure the success of the interventions.

The United Nations adopted the 17 SDGs in 2015; these SDGs collectively aim "to end poverty and hunger everywhere; to combat inequalities within and among countries; to build peaceful, just and inclusive societies; to protect human rights and promote gender equality and the empowerment of women and girls" (Siddhartha et al., 2021, p.2).

In order to achieve sustainability within the social value development process, the determinants of the social value should be able to address and contribute to the attainment of the SDGs. The determinants, referred to here as the Social Value Imperatives, as uncovered through the qualitative analysis process and their existence confirmed through the quantitative analysis, were linked to some of the SDGs to show how sustainability can be achieved. Table

11 shows the alignment.

Table 18

Alignment of SDGs with the Carnarvon Social Value Imperatives

SDG Goal	Alignment to Social Value Imperative
SDG 1: *End Poverty*; **SDG 2:** *End Hunger*; **SDG 6:** *Clean Water and Sanitation.*	**SVI3**: Observing and upholding dignity.
SDG 3: *Good Health and Well-being)*; **SDG 8:** *Decent Work and Economic Growth.*	**SVI5**: Upholding the worth of human beings.
SDG 11: *Sustainable Cities and Communities*; **Goal 16:** *Peace, Justice, and Strong Institutions.*	**SVI2**: Community engagements **SVI4**. Inclusivity **SVI6.** Protection of Vulnerable Groups.

The social value imperative, which focuses on observing and upholding human dignity, designated as Social Value Imperative 3 (SVI3), is realised when social entrepreneurship initiatives are designed to improve living conditions, enhance service delivery, and ensure that all individuals benefit from positive developments. Human dignity is upheld when there is no poverty or hunger, and when people have access to clean water and sanitation. SDG 1 aims to end poverty for everyone, SDG 2 focuses on ensuring that no person goes to bed hungry by eliminating world hunger, while SDG 6 deals with the sustainable provision and management of water resources to ensure that everyone has access to clean water and sanitation (Fonseca et al., 2020). A focus on upholding the dignity of human beings inevitably means being involved in actions that contribute to the attainment of the three SDGs, thereby contributing to sustainable development.

Social value imperative 5 deals with upholding the worth of human beings. The outcome of the analysis showed that the people of Carnarvon feel that their worth as human beings is being upheld when they have decent work and generally improved living conditions. These requirements are linked to SDG 3, which seeks to ensure good health and the well-being

of people, and SDG 8, which seeks to ensure decent work for everyone through sustainable economic development and job creation. The intentions espoused through the social value imperative of upholding the worth of human beings are strongly aligned with SDGs 3 and 8.

Similarly, SDGs 11 and 16 are linked to SVIs 2, 4, and 6. Social imperative 2 deals with community engagement. This is about including the community as worthy stakeholders in the process of creating their social value. Engaging stakeholders has the power to neutralise conflicts and bring about peace, as observed by Grama-Vigouroux et al. (2020) and Sachs & Kujala, 2020). The recognition and inclusion of stakeholders in the construction of their social value aligns with the aspirations of SDGs 11 and 16 of ensuring cities and human settlements are inclusive and safe. SVI 4 and 6 also deal with issues of inclusivity and protecting those who may be susceptible to unwarranted treatment in the community. Pursuing social value through the implementation of social entrepreneurship initiatives that foster community engagement, inclusivity, and the protection of vulnerable groups supports the Sustainable Development Goals (SDGs) and promotes sustainability.

Limitations

The purpose of this section is to acknowledge the number of constraints that came into play during the execution of this research. The researcher will show that most of the challenges and difficulties encountered were meticulously leveraged into opportunities that allowed for a robust and rigorous research process.

Methodological Limitations

This study chose to employ a mixed methods approach. In the first phase, qualitative data were collected and analysed, and the resulting findings informed and shaped the second phase, which gathered survey data and utilised quantitative statistical methods for analysis. Although the mixed methods approach is preferable, as it provides both breadth and depth in

the epistemological grounding and methodological approach of a study, it comes with several challenges. Several scholars identify specific difficulties related to this approach, such as choosing the appropriate mixed methods design to use for the study, how to integrate the divergent epistemological frameworks, as well as data integration strategies (Almeida, 2018; Dawadi et al., 2021).

These specific concerns were not material to this study as they were integrated into the study design and approaches, which were dictated by the main objectives of the study. The study first needed to determine what residents of Carnarvon consider the determinants of their social value. This process requires the researcher to conduct an in-depth analysis of the views, beliefs, and sentiments of the people by interacting with them within their natural environment. Achieving this objective requires qualitative methods based on the epistemological framework that says there is no absolute truth; the researcher and the people concerned will engage in this process to uncover the truth and build knowledge together. It naturally followed that in the first phase, interviews would be used to collect data and analysed through qualitative methodologies. Similarly, the second phase aimed to quantify the aspects and elements that would have emerged from the first phase. The epistemological framework and the data collection and analysis methods naturally became aligned with quantitative approaches.

Designing the integration approach of the two methods was also not a difficult decision to make, as it followed naturally that the results of the first phase would inform the processes in the second phase. Again, the research design dictated a seamless integration process that happens naturally as the study progresses from one phase to the next. However, at the practical application level, the process proved to be filled with a number of challenges that would not have been anticipated. The specific challenges encountered as a direct result of the choice of the methodological approach affected the identification and recruitment of participants and the time and resources available to complete the data collection and analysis process.

Sampling Challenges: Using the mixed methods approach meant that the researcher needed to collect two sets of data from two different sets of audiences. The initial set of data was to be collected through face-to-face interviews with heads of households in Carnarvon. The community of Carnarvon is made up of people residing in three different settlements; as such, to obtain balanced views, the researcher had to ensure that all three settlements were equitably represented in the data collection. A sampling procedure that is otherwise consistent with quantitative processes had to be used to obtain an a priori sample, representative of each settlement. Although this approach was a limitation in terms of using sampling procedures that are not consistent with the research methodology under consideration, it became a necessary measure to manage the quality of the data obtained.

In a qualitative approach, where the researcher aims for saturation, the sampling, data collection, and analysis processes are undertaken simultaneously. The focus of this approach is to immediately halt the processes at the point where saturation is reached. However, in this case, it would be useful to describe how saturation is viewed by the researcher so as to justify the specific approach adopted.

Saturation can be viewed from two approaches; one approach deals with a point where new themes or codes no longer emerge, while the other approach deals with a point where there's no more enhancement of the already developed themes (Saunders et al., 2018).

A third approach, quite different from the first two, examines saturation from the perspective of the intersection between theory and data. It states that saturation has been achieved when there is enough data to support the theory (Saunders et al., 2018).

This means that saturation will not happen at a fixed point in the data analysis process; instead, the researcher would rather have some sense of comfort at some point that they have managed to support the underlying theory in the data adequately. Given that saturation is not necessarily viewed as a specific cut-off point in the data collection and analysis process, but a

sense, from the researcher's perspective, that a satisfactory level of saturation may have been achieved, the analysis can continue to confirm and validate the claim of saturation.

Working from that premise, the approach in this thesis was to separate the sampling, data collection and analysis processes with the understanding that analysis of the already collected data may stop at any instance when the researcher feels that they have adequately extracted sufficient data to support the predetermined theoretical elements of social value. Having taken the deductive approach, where the data was expected to confirm the predetermined social value categories, saturation was seen as the situation in which the researcher felt that enough justification for the existence of the theoretically predetermined determinants of social value had been extracted from the data, and therefore, not a specific point after the analysis of a confined number of transcripts.

When analysing the data, the researcher was satisfied that theoretical saturation was reached after 58% of the transcripts were analysed. While the researcher had a sense that saturation may have been reached at 58% of the transcripts being analysed, more transcripts were analysed to confirm the view that saturation had been reached. Although this may suggest a level of uncertainty as to the point at which saturation was reached, it was, in essence, a necessary step to confirm and validate the saturation.

The second phase of data collection involved obtaining quantitative data from the participants of the SKA Socioeconomic Development Programme. This was a targeted population sampling approach since the number of individuals who participated in the programme was small and manageable. However, not all the individuals in the targeted population were available or reachable, such that only 155 could be reached. However, relying on The low number of respondents who came forward for this study means that the results may not be generalised. For statistical purposes, the population was adjusted to be 155 with a 76% response rate (118 questionnaires returned). The unavailability of the 165 would not affect the

results, as there are no major systematic differences among the respondents; hence, the experiences and attitudes towards the SKA socioeconomic development programme would be the same, and the obtained samples would still offer credible information.

Time and Financial Resources Challenges: Conducting interviews is a time-intensive exercise in its own right, and conducting them face-to-face in people's homes may add further time due to interruptions and disturbances. This meant that the researcher needed to be in the area for an extended period. More time spent in Carnarvon meant higher financial resources for lodging and subsistence. The researcher needed to create an opportunity for this constraining situation to work in favour of the research process without compromising quality. The number of households to be interviewed was identified in advance using a random sampling process. The recruitment process was combined with the actual interviews; the researcher would arrive at a household and request to speak to the head of household. The whole interview process would be explained, and all the necessary consent procedures would be administered. If the participant was happy to proceed with the interview, it would proceed immediately. The majority of households were accommodating and agreed to participate in the interviews; however, a few did not consent, but this did not affect the targeted number of participants.

In a qualitative study, when the data collection procedure requires thematic saturation, the researcher typically collects several data samples, analyses them to identify themes, and continues conducting interviews while analysing until no new themes emerge. This process was modified because the data needed to be collected all at once to manage the available time. The interviews were completed in the shortest time possible so that the researcher could spend as few days as possible in Carnarvon. This approach added rigour in the sense that the researcher was able to continue with the interviews without being influenced by the themes that would have otherwise been identified if the data had been analysed during the interview

process. The themes that emerged during the analysis would not have been driven by any of the interviewer's biases. Secondly, analysing the data at the end of the interview process provided more time to work through the text and ensure thorough and meticulous extraction of codes. The time and budget constraints necessitated innovative approaches that added more rigour and thoroughness to the study.

Analytical Limitations

Analysing statistical data can be overwhelming for novice researchers. The situation is exacerbated when the research method requires complex statistical techniques, such as structural equation modelling, which involves specialised software like Analysis of Moment Structures (AMOS). This was one of the constraints encountered during the quantitative data analysis process in this study. In this instance, the researcher needed to confirm hypothesised relations between several factors, especially where a latent variable is involved. As explained by Almeida (2018), the Confirmatory Factor Analysis technique would be the best statistical method to employ in this case. However, the modelling of the relationships, as well as using the relevant software, proved to be challenging. The time available to complete the research would not allow the researcher to take a course that would build competency in the relevant statistical field. As an alternative, descriptive and inferential statistical techniques were employed. Using a combination of methods brings with it the challenge of integrating the analysis. This resulted in a lengthy period of analysis, which was necessary to ensure the accuracy of the analysis and interpretation of the results.

Limitations of Scope

The socioeconomic development program for the SKA project specifically focuses on four towns: Carnarvon, Williston, Vanwyksvlei, and Brandvlei. These towns were included in the SKA service area because the extent of the antennas of the telescope overlaps with each town. It would have been ideal to test the social value dynamics of each town to have a

broader perspective on how the SKA project has contributed to shaping the socioeconomic development in the area; however, undertaking such an endeavour would have meant expending three times the resources utilised in completing this research. Neither the time nor the budget was available, and a conscious decision was taken to limit the scope of the research as a means to manage the limited resources.

Carnarvon is the centre of operations for all SKA activities; as a result, the majority of the socioeconomic development programmes are implemented from the town. An understanding of the dynamics in Carnarvon would provide a better view of the SKA's intervention in the area; however, given that the conditions in the towns might be different, the findings about the nature of social value in Carnarvon may not be directly transferable to the other towns.

Language

The South African Society is multilingual and multicultural, with twelve official languages, each coming with multiple dialects and different cultural orientations. It is inescapable that a researcher may encounter an interviewee who speaks a different language from the one in which the research is being conducted, in this case, the English language. In a case where the researcher and the informant can speak a common language, the interview can be handled in that language and reduced to English for analysis. However, in a case where the researcher and the informant cannot understand each other due to language differences, an interpreter would need to be brought on board. The involvement of a third party as an interpreter in an interview comes with dynamics that could affect the outcome and even the quality of the data obtained, thereby threatening the validity of the results. Interpretation can affect the flow of conversation between the researcher and the informant, as the interpreter might exert subjective influence on the informant and also on the communication process (Filep, 2009).

This situation was foreseen in Carnarvon since the dominant language is Afrikaans, followed by English and IsiXhosa, and the researcher was not proficient in Afrikaans, so it would be anticipated that interviews with Afrikaans-speaking participants would require an interpreter. A plan was put in place to counter difficulties that might arise during the interpretation of interviews. A local interpreter who understands the culture and language nuances of the place was sought. It was easy to locate such an individual since there were previous researchers in the area who also needed to use the services of an interpreter, and several university graduates who are proficient in English and Afrikaans were enlisted.

The interviewer needed to understand the purpose of the research, the objectives of the interview, and the researcher's strategic approach in getting the respondents to engage in dialogue; as such, the researcher and the interpreter spent a considerable amount of time workshopping the interview process. After a series of interviews on the first day, the researcher and the interpreter would reflect on the process and correct some of the issues that came up. In some instances, for example, the informant would seem to hold back and not want to engage in open dialogue, giving short and almost encrypted answers. During the debriefing, the interpreter would explain that some respondents were apprehensive for fear of saying something bad about the SKA staff and jeopardising their chances of employment. In such cases, the interpreter was encouraged to give assurances to the informant that the interview is anonymous and the information obtained in the interview will not be shared with anyone, and also to advise them that they can terminate the interview if they feel uncomfortable. Some interviewees opted not to be recorded, while others exercised their option to terminate the interview. To ensure the accuracy of information, a professional translator and transcriber were contracted to translate the Afrikaans recordings into English and transcribe.

Researcher's Reflections and Biases

Earlier discussions on the concept of researcher bias made it clear that, due to the nature of the qualitative knowledge creation processes, the researcher's worldview is highly likely to affect the outcome of the study. The researcher's worldview is bound to shape the nature of the new knowledge created in the research process. According to Leon Festinger's theory of cognitive dissonance, when an individual is faced with a situation where two pieces of information held in their conscious mind are in direct contrast with one another, the individual will attempt to block the manifestation of the conflict by avoiding further information assimilation that will concretise the disparity, as a natural means to avoid psychological discomfort (Harmon-Jones & Mills, 2019). The psychological discomfort avoidance process is unconscious but leads to conscious decisions that repeatedly shut out or avoid information that could reinforce the cognitive discrepancies. As a result, the researcher will unconsciously avoid information that could lead to findings that are divergent from their worldview and inherent beliefs.

In the case where the researcher is aware of his/her worldview and knowledge creation framework, and aware of how this could influence their interpretation of the results of the study they are conducting, he/she would be in a position to guard against suppressing conflicting information and accept the outcome of the results as is without enduring the pain of cognitive dissonance. In this particular case, the researcher approached the qualitative analysis with a clear understanding that his background and previous experiences needed to be consciously guarded against influencing the direction of the analysis.

On the one hand, the researcher is a public servant, employed in the Department of Science, Technology and Innovation in South Africa. Being a public servant, the researcher's primary responsibility is to ensure that the Government plays its role in responding to its national priorities of development. As part of the government, the researcher has a direct

interest in seeing positive socioeconomic developments, especially in poor rural communities. As such, the researcher will ensure that any action taken should result in maximum impact towards the attainment of the government's national priorities.

On the other hand, the researcher represents the government's interest in the SKA project. This responsibility includes ensuring that the implementation of the SKA project occurs within a policy framework that will achieve the project's goals, which focus on the scientific domain and the advancement of the knowledge enterprise. These objectives compete with the government's developmental priorities. The two layers of interest appear to be irreconcilable, as one emphasises that the government must provide impactful services to the community, while the other urges the same government to allocate resources for the advancement of knowledge, which is far removed from the impactful service delivery approach. It would be tempting for the researcher to adopt a stance that favours one interest over the other. If that were the case, the tension between the competing priorities would threaten a balanced interpretation of the results, creating a bias against results that favour the Big Science project as a scientific endeavour rather than a service delivery vehicle. Conversely, if the researcher asserts that his interest lies in science and that impactful service delivery should be the concern of other government instruments responsible for service delivery, the bias would shift against the Big Science project, thereby jeopardising value delivery for the community.

To strike a balance between these priorities, thereby avoiding a biased approach that favour one side over the other, the researcher adopted a neutral stance that accepts the scientific orientation and mandate of the scientific endeavour while also acknowledging the need for service delivery to the community. In this approach, the researcher was able to maintain neutrality and avoid any bias towards any one of the sides. This position was able to assist in letting the results speak for themselves and point to a neutral outcome where the Big Science

initiative maintains its science and knowledge creation mandate while assisting, as an additional effort, the community in achieving its social value goals.

It was surprising that the results showed that the SKA project is actually providing value-aligned interventions, while also incorporating some humanistic approaches in its implementations, as this would not have been expected for a scientific endeavour whose aim is to build a scientific instrument. The presence of value-aligned efforts within the project gives comfort that there is room for these kinds of projects to make meaningful interventions in society, hence the proposal for a social value model to be integrated into the operations and management of the Big Science initiative.

Summary

The limitations section addressed the constraints and challenges encountered during the execution of this research. Firstly, the issue of methodological choice was examined. The general difficulties related to using a mixed-methods approach as a research methodology were unpacked, highlighting the obstacles related to decision-making in terms of which specific approach of the methodology to use and the difficulties related to data integration. These were found not to have posed any significant challenge in this research, as they were adequately addressed during the research design phase. The two main difficulties that arose as a result of the researcher's choice to use the mixed-methods methodology relate to time and budget. These two factors influenced the approach taken in the collection of the qualitative data, which involved conducting face-to-face interviews. The preferable approach would have been to continue to analyse the data while it is collected, leading towards data saturation; however, in this case, the process followed was to collect all the data at once and commence with the analysis once all the identified participants were covered. This approach was designed to save time while effectively managing the thin research budget. The researcher believes that this approach contributed to the quality of the data as it removed the possibility of swaying the

interviews in a particular direction based on the themes that would have been observed had the data been analysed while collection was going on. It also provided more time to analyse the data and ensure that all possible themes were extracted.

The scope of the research was also another limiting factor. It would have been ideal to include all SKA areas; however, due to time and financial constraints, only one town was chosen. The chosen town does not provide a representation for the other towns, and for the results to be applicable in those towns, data from them should be considered.

On the issue of language, the services of an interpreter were obtained to deal with communication in Afrikaans. Care was taken to ensure that the interview process proceeded smoothly and in-depth information was acquired.

The researcher's biases were reflected upon, and ways in which they were managed so that they do not interfere with the results were discussed. The researcher became consciously aware of the cognitions that could sway the interpretation of results towards a particular direction and approached the research with that awareness to guard against being swept away by such influence. Bias is an inherent issue in qualitative research; however, the researchers' awareness and effort to consciously suppress biased interpretations helped to minimise their influence on the results.

Lastly, the sample size for the quantitative may be considered a constraint due to the low response rate of 76%. However, based on the quantitative analysis route adopted in this thesis and relying on Sabol et al. (2023), the response rate would not be considered an impediment in terms of the validity of the results. A retrospective power analysis, which took into account the coefficient of determination (R^2) of 0.785 obtained in the two-stage analysis, the corresponding effect size (f^2) was found to be 3.651, with a corresponding statistical power approaching 1.00. As this value exceeds Cohen’s (1998) proposed statistical power of 0.80, it provides confidence on the validity of the results based on the available sample.

Within the constraints discussed above, the results are credible and applicable to the community of Carnarvon.

Implications to Practice

The main objective of this thesis was to foster sustainable socioeconomic development in communities that are adjacent to Big Science initiatives or any large infrastructure project, for that matter, through the use of humanistic principles applied within a social entrepreneurship setting. The research uncovered specific elements that, when attained in the community and on behalf of the community, lead to the attainment of social value. An implementation framework that can be used by large infrastructure projects to incorporate value creation as part of their business strategy. When a large infrastructure project plans for value creation as part of its strategic approach, it will be able to show upfront what impact it will bring to the community. Demonstrating social impact upfront will help funders evaluate the return on the investment they make in a project, thereby streamlining policy decisions in the funding of these projects. The proposed framework is discussed in the next section.

The Humanistic Social Value Model

The implications of the results of this thesis relate to the third research question: How can the SKA project apply humanistic management principles in its socioeconomic initiatives to achieve sustainable social value? The results identified specific principles that should be incorporated into a socioeconomic development programme initiated and managed by a Big Science initiative. These principles and factors were recognised by the people of Carnarvon as essential in creating social value. This thesis proposes a model that would assist Big Science initiatives to bring together the identified principles and elements in developing a comprehensive and effective community socioeconomic development programme, thereby ensuring the development of Social Value for the people who deserve positive impact from the implementation of a Big Science initiative within their vicinity. The qualitative and quantitative

data showed that there was significant work done towards the development of Social Value by the SKA project; however, the success and real impact of the programmes are hindered by a deficiency of key elements of social value.

The deficiencies leading to the non-achievement of full Social Value could be attributed to actions and approaches that are not in line with humanistic practices. This scenario indicates that, although there's considerable development in the area, as identified by many researchers who evaluated the extent of socioeconomic development in the area, including the likes of Gastrow and Oppelt (2018), Mokhohlane (2023) and the Urban Econ evaluation study, there is still a lack of Social Value as envisaged by this study. The proposed model is designed to incorporate and implement value-oriented approaches and entrench humanistic principles in the implementation to ensure sustainability.

Big Science initiatives need to adopt and apply a systematic humanistic-based approach in their value creation efforts. This will assist in defining a community-aligned mandate for the project while also bringing the community on board in the process of building and sustaining their social value.

Based on the theoretical intersection between humanism and social entrepreneurship, a systematic approach could be framed using a standardised model that can be utilised by Big Science projects to bridge the gap between the existence of social value and the implementation of humanist principles, thereby ensuring that the social value created is sustainable. The proposed model is shown in Figure 6.

Modelling is a powerful tool in research because it enables researchers to represent complex systems by illustrating purposeful activities and their relationships (Checkland, 2000). It involves defining system boundaries, identifying key components and relationships, and using diagrams to simplify the connections, interactions, relationships, and hierarchies.

Robinson (2008) defines conceptual modelling as the abstraction of a real-world system

into a simplified representation to guide implementation. A conceptual model can act as a bridge between the planning and design phase and the technical implementation phase, thereby streamlining the implementation process.

The process of developing a conceptual model involves identifying stakeholders, entities, and processes, and establishing connections using iterative diagramming (Sarker & Lee, 2002).

The proposed model is based on the social innovation process that was first developed by Vázquez-Maguirre and Islas and later used by Vázquez-Maguirre (2020) to analyse the process followed by communities in Latin America in their indigenous social enterprises to generate social sustainability in their societies. This process enabled the communities to regain their power by taking control of their social development and sustainability.

The model integrates humanistic management principles, isolating specifically factors that emerged as determinants of social value and integrating them within a social entrepreneurship approach to developing a programme of social intervention in an economically depressed society. It seeks to guide and control the process of including socioeconomic development as part of Big Science project planning and implementation. As such, the process should be integrated into the planning and initiation of the project so that it forms part of the project charter. The structure and elements of the model are discussed below.

Figure 6 depicts a cascading model that consists of four interconnected compartments, with each compartment having several steps that lead to the next compartment. The first compartment involves conceptualisation and planning, followed by technical analysis, which leads to implementation with monitoring and evaluation built into the implementation phase. The execution of the model is cyclic, such that evaluation and reflections may lead to a re-look at the previous step or lead to adjustment of any of the phases during implementation. The ultimate goal is to arrive at a fully functional system that is appropriate for a given context and

properly designed to deliver social value within the constraints of such context.

Conceptualisation and Planning

The first phase of the model involves a thought process that is aimed at putting together the skeletal structure of the Social Value delivery programme to be implemented in a specific community by a Big Science initiative. The activities in this phase will include determining the conceptual structure of the programme, stakeholder consultation and aligning the planning process to the theoretical basis of humanism and social entrepreneurship, where specific context-based elements are integrated into the implementation of the programme. Each step within the first stage is unpacked below:

Conceptualisation: This process relates to the high-level conceptualisation and planning of the Big Science project. The theoretical framework (Butler, 2018; Cruz, 2019; Mansell & Philbin, 2020) has shown that planners and implementers of Big Science projects always assume that implementing these projects will result in socioeconomic benefits for the community; however, it is not clear as to what specific benefits are expected and delivered to the community during implementation (Beck & Charitos, 2021; Chinigò & Walker, 2020; Gastrow & Oppelt, 2018). In order to align the mandate of the Big Science initiative with the expectations of the community, the expected social returns on investment on the project should be mapped out at the onset. This process should include defining the expected nature of social impact as a consultative process between the project and the community. The model proposes that at the conceptualisation phase, the process of defining the socioeconomic benefits for the specific community is initiated. The model outlines the process of defining and planning for the socioeconomic development component of the project. As stated earlier, this process becomes part of the project charter. The following steps shall be followed as part of the planning process for the humanism-based social value creation process.

Stakeholder Consultation: This thesis has discussed at length the significance of

stakeholder consultation, especially as part of the humanistic approach. The foundation of the humanistic approach was built around the notion raised by Nida-Rümelin (2009) and Odumegwu et al. (2022) that humanism is about putting the interest of the individual first and allowing them to freely express themselves. A similar approach was used by the Indigenous people of the Latin American communities referred to earlier.

Some of the literature reviewed at the beginning of this research process showed that the SKA project is implementing interventions in education, training and skills development (Binneman & Davis, 2021; Hickman, 2008; Tiplady, 2021). These were cited as some of the positive developments in the area, thereby considered as part of the social impact brought about by the SKA project. However, there has been evidence of dissatisfaction to the extent of major dissent against the project, which almost threatened the implementation and stability of the project. The gaps identified in the implementation of the socioeconomic initiatives could be addressed through this process of consultation, so that a consensus is built as to what should be the focus of the social impact in the community.

The purpose of the stakeholder consultation and engagement process would be to allow the community to express their views about various issues that they consider as priority, key and critical to their well-being as a community.

Sectors of society, including education, health, security, housing, and job creation, should be scrutinised to establish challenges and issues that would need to be tackled. The main outcome of this process should be twofold. One of the outcomes should be an established, strong relationship between the project planners and the community; this relationship should be based on trust, openness, and honesty, for it to support the humanistic-based social value creation process. The second outcome should be a baseline report detailing the state of affairs in the identified sectors.

Theoretical Alignment: The situational analysis conducted in Step 1 and the resultant baseline report will reveal the major problems existing in the community. The critical factor within the humanistic approach, key to effectively addressing relevant social problems, is the identification of the areas where the dignity of the people is being neglected and dealing with those in a systematic approach. This step deals with the process of identifying those dignity affronts in answering the question of what the crisis is. Within the spirit of social entrepreneurship, where solving societal problems is a joint effort, the community should be allowed to make input and accept the identified areas as areas that relate directly to their dignity. There should be a constant feedback loop between Step 1 and Step 2 to ensure that the identified areas represent the views and needs of the community as related to how they view their dignity. At this stage, there should be trade-offs and bargaining, however, done within an open, fair, and meaningful consultative process so that all sides are satisfied with the outcome. The community needs to understand that the Big Science project is not a service delivery vehicle but is only willing to intervene as part of giving back to the community that hosts the project; as such, the project will not be able to tackle all the problems in the community. The tradeoff should yield a fair consensus in terms of the specific areas that are suitable to be tackled by the Big Science project. Answering the question of What is the major crisis? and getting a consensus on the specific areas of crisis to be tackled will lead to the next stage, where a roadmap is developed.

Technical Analysis

The technical analysis phase starts to put together the tools required to achieve the identified state of Social Value in the context of implementation. The first step in this phase applies the Theory of Change concept, where the elements of the first phase are put together to set out a practical path towards achieving the social value. Once the social theory of change is mapped, the intervention programme is put in place and implemented. This phase is closely

linked to the next phase of monitoring and evaluation. As the specific interventions are outlined and are tested for appropriateness, they will be evaluated and readjusted to fit the envisaged social value path. The process is iterative and ongoing throughout the implementation life cycle of the programme.

Theory of Change: Theory of Change (ToC) is a tool used for conceptualisation, planning, and delivery of an impact-oriented programme to guide the process of attaining long-term impact (Fur et al., 2020). The process involves the use of visualisable representations of specific pathways that lead to clearly defined milestones, which in turn, lead to the achievement of the outcome, which is to effect lasting change. Building a ToC for a specific project requires that stakeholders come together to negotiate the strategic interventions, processes, and pathways towards the attainment of the intermediate goals. The involvement of all stakeholders in this process is key since the building of the ToC requires that focused interventions are specified and described, clearly outlining the roles and responsibilities of the different stakeholders and clearly outlining how those interventions will feed into each other in the process of turning around the situation in the community from a crisis to a the desirable state, as such the interventions should be accepted and owned by everyone to ensure full cooperation of all stakeholders in the implementation process.

In this case, the outcome and impact of the ToC would be the attainment of social value, as such interventions that are relevant to the community, which address the social value imperatives relevant to the specific communities, would be specified as the intermediate goals. Achieving these social value imperatives would lead to the attainment of the social value as the outcome and desired impact of the ToC.

Stage 4: Intervention Design: The theory of change specifies the required strategic interventions, the relevant stakeholders and collaborators, as well as the required resources. At

this stage, the specific actions to be taken are defined. Solving community problems would usually require the combined effort of multiple stakeholders. During this stage, the different stakeholders who have a stake in the provision of services in the community would be engaged, mobilised, and brought on board. Some of the possible stakeholders to include in the process include local and national government departments that have a stake in the development of the community, the business community operating in the area, or who are likely to have an interest in the implementation of the Big Science project, and civil society groups.

These stakeholders should be led by a consortium of the community and the Big Science implementers so that the focus on the main goals of the interventions is maintained, and control over the implementation is maintained. Each stakeholder involved in the process should bring in resources. The different stakeholders should understand that service delivery and socioeconomic development are not the primary mandates of the Big Science project, but the project acts as the leader and coordinator of the process. The collaborators involved should be ready to bring funds, as the Big Science project is there to offer an organised and seamless gateway for achieving their service delivery goals, thereby meeting some of their strategic objectives.

Stage 5: Execution: This is the last stage of the social value intervention process, where the identified interventions are implemented. This process is forward-looking and long-term, as some of the interventions may depend on the stage of implementation of the Big Science project. However, there should be constant monitoring and evaluation while providing feedback to all the stakeholders, and most importantly, the community members.

Alignment with SDGs: The Humanistic Social Value model should be aligned with the SDGs. It was shown that sustainability is achieved when strategic interventions are designed to address some of the SDGs. During the planning stage, the interventions identified should be designed to align with the SDGs.

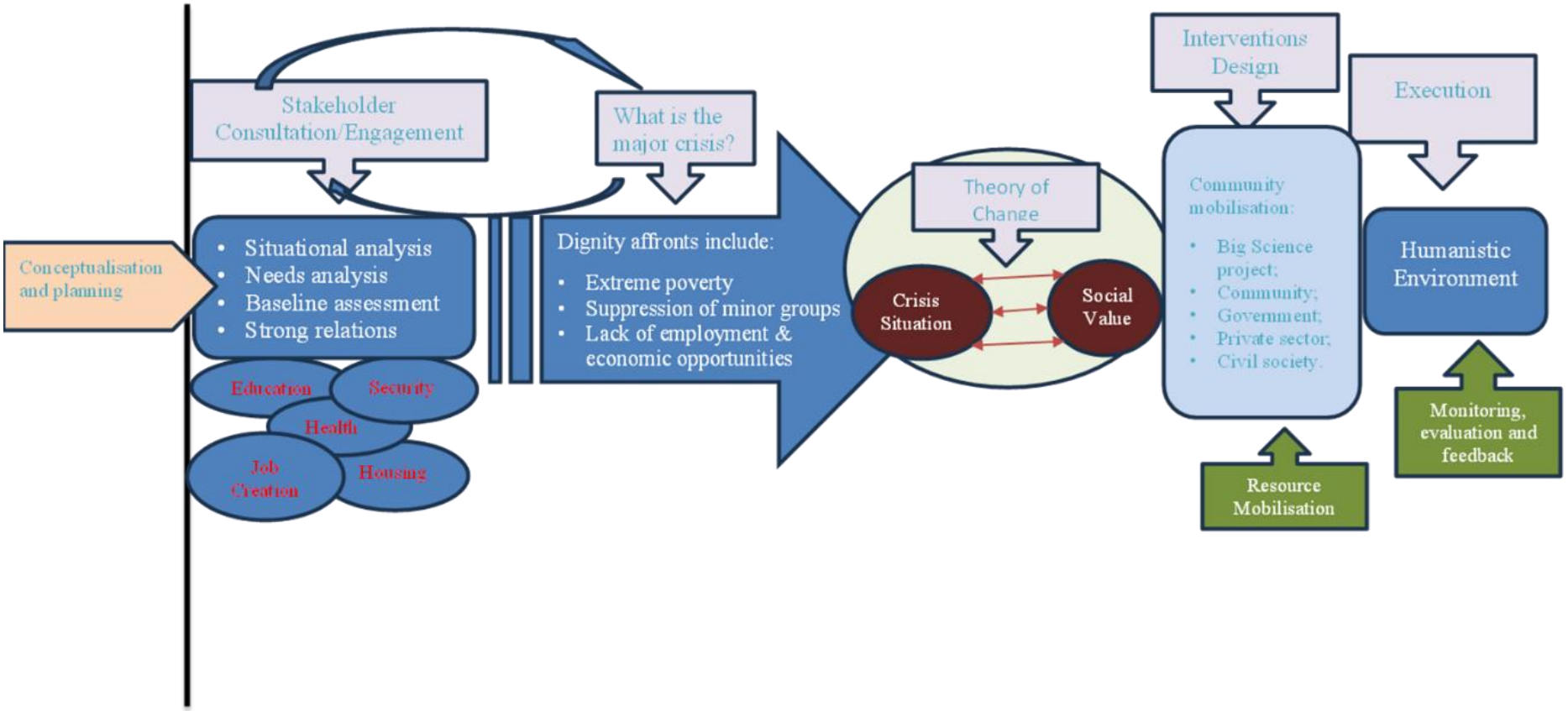
Recommendations for Application

The theoretical framework developed in this thesis proposed that the application of humanistic management principles within a social entrepreneurship environment has the potential to deliver sustainable social value (Koon, 2021; Matheson et al., 2021; Melé, 2013; Pirson, 2018; Vázquez-Maguirre, 2020). The literature review further highlighted the contest between reaching the goals of organising a business structure for profit maximisation against organising for humanism and preserving human dignity. Mejia (2019) is of the view that following humanism principles in business management is a fruitless exercise that is likely to derail management from its principal goal of delivering value to the shareholders, while Parker and McHugh (2013) attempting to organise for humanism in business could be daunting, but still useful and rewarding if done with care and diligence. It is clear that, notwithstanding the challenges associated with the incorporation of humanism in business management, applying the principles of humanism could assist a business in achieving higher goals.

In the case of the SKA project, the results of this study have shown that even though the system was not deliberately organised for humanistic approaches, elements of humanism were found in their practices, more especially in the implementation of the socioeconomic development programme, and this led to the community of Carnarvon experiencing value. Although social value was found to exist in Carnarvon, the animosity between the SKA projects and the community persists, and this study could not explain the source of that animosity. It could be worthwhile to study the source of this animosity against the SKA project.

Figure 6

Humanistic Social Value Model



The presence of humanistic principles within the interactions between the community and the implementers of the SKA project presents a strong case for the uptake of the proposed Humanistic Social Value Model discussed in the preceding section in the planning and execution of any Big Science project. The theoretical framework developed in this thesis on the role of humanism applied within a social entrepreneurship environment in contributing to the development of social value, coupled with the findings that the SKA was able to create value in Carnarvon by incorporating humanism in the management of the socioeconomic development programme implies that the deliberate use of this approach could enhance the process of delivering value by Big Science projects.

Furthermore, we have learned from the work of Bandinelli (2019), Chliova et al. (2020), Gintere an Licite-Kurbe (2022), Gupta et al. (2020), Morris et al. (2021), and Shukla (2020) that when setting up a social entrepreneurship practice, one need not concern themselves about the what and how of the process, but should only focus on the end goal, which is to solve societal problems and deliver sustainable value. Similarly, the approach adopted in the Humanistic Social Value Model does not specify what social entrepreneurship is or define specific elements and artefacts that qualify the process to be classified as social entrepreneurship. However, the process is defined based on its principal purpose and the goals to be achieved, which revolves around identifying specific social problems and devising measures to solve those problems and deliver value.

Applying the Humanistic Social Value Model

The Humanistic Social Value model offers an opportunity for organisations that have as their mandate or where there is an expectation of societal impact to make a meaningful, impactful, and sustainable change in the communities within which they operate. Organisations managing Big Science projects tend to neglect the responsibility of delivering value in the local communities within which they operate, believing or operating on the assumption that

socioeconomic development accrues as a natural by-product; as such, they do not include the component of social value delivery as part of their planning. The Humanistic Social Value model offers a framework for implementing social value delivery activities.

The model allows the organisation to define specific goals from the onset of the programme, design specific interventions geared towards achieving them, and mobilise resources and stakeholders necessary for achieving them. This approach solves three problems that were part of the concerns that led to the initiation of the study.

In the first instance, it solves the problem of enumerating and quantifying the extent of socioeconomic development that is attributable to the large-scale infrastructure project operating in a specific area. This problem was first highlighted by Gastrow and Oppelt (2018) when observing that there was a lack of empirical evidence pointing to the existence of social value created by the SKA project. The operationalisation of the model will ensure that delineation, enumeration, and reporting on social value become a scientific process rather than a function of the ideological orientation of the assessor (Behar & Sykes, 2022; Denny-smith et al., 2021; Fitton & Moncaster, 2021; Fujiwara et al., 2021; Kalyviotis et al., 2020; Watts et al., 2021, Nalewaik & Williams, 2021).

After dealing with the problem of measuring social value, the second problem to be addressed by the utilisation of the Humanistic Social Value model is that of localising socioeconomic development. Cruz (2019) and Beck and Charitos (2021) showed that even though there is a general belief that Big Science projects lead to some development, such development fails to make an impact at a local level. Butler (2018) further clarified the extent of this problem when highlighting the contestation of what development means from the perspective of the project implementers versus the views of the local community where the project is based. Butler found that while the implementers of the project were enthusiastic about the positive developments of the Big Science project, they couldn't explain the nature of the

development, while the community did not see any development coming out of the project. Similarly, Mokhohlane (2023) found evidence of socioeconomic development attributable specifically to the implementation of the SKA project within its local areas, but also found, on the other hand, that the community does not acknowledge any development impacting their lives. The Humanistic Social Value model will be useful in reconciling the concept of social value and facilitating consensus between the implementers of the project and the community so that there is a common focus on what needs to be done to bring about social value to the local community, thereby facilitating and enhancing the social legitimacy of the project.

Lastly, the Humanistic Social Value model will be able to solve the problem of funding. Some of the literature quoted in this thesis discusses the problems associated with the funding of Big Science projects. Withers (2021), for instance, suggested that Big Science projects should not be prioritised for public funding over the delivery of essential services for human needs, as they do not offer value to society. Being able to demonstrate the extent of social intervention that a Big Science project can facilitate will make it easy for policymakers to justify their allocation of public funding to the project.

Recommendations for Future Research

The design and implementation of this research provide several opportunities for future research that could add value to the Big Science research enterprise and knowledge development. The research area in the humanism and social entrepreneurship domains also stands to benefit from research opportunities opened by this research.

The first area of research relates to the expansion of the social value analysis into the other towns that fall within the SKA feeder area, beyond the town of Carnarvon, or even into areas under a different Big Science project. Due to limited resources, the research was confined to the town of Carnarvon. Given that there could be different social conditions prevailing in

the other towns, such as the lack of access to quality education, for instance, social value factors different from those uncovered in Carnarvon could come up. Diversifying the research into other settings could help shed more light on the nature of social value and help align social value-determining factors to specific social settings. An opportunity exists to expand the research into Williston, Vanwyksvlei, and Brandvlei. It would also be interesting to test the nature of social value in areas under the purview of other Big Science projects.

Another research opportunity exists in testing and refining the Humanistic Social Value model. The current research focused on developing the model based on the outcomes of the study. At the moment, this model is only a theoretical postulate; the research was constrained by time and resources and could not proceed to test its applicability in practice. This situation gives rise to the possibility and desirability of a longitudinal study that would test, with a view to modifying or perfecting the model to ensure that it accurately provides the intended results of fostering the application of the principles of humanism within a social entrepreneurship environment to develop sustainable social value, more especially in impoverished communities.

Conclusions

The main purpose of this study was to determine how Big Science initiatives, or large infrastructure projects in general, could be involved in generating sustainable social value in communities within which they operate. Even though the delivery of socioeconomic intervention is outside the existential mandate of the Big Science initiative, there is a general expectation that a Big Science initiative would intervene in the communities within its locality to address socioeconomic ills and uplift the standard of living of the local people. This is largely because Big Science projects draw fiscal resources from the same pot that would have otherwise taken care of urgent government social development imperatives. The natural

assumption, more especially within the context of South African society, and perhaps other similar societies which have high levels of poverty and other social ills plaguing mostly rural and less developed areas, is that the investments that the government makes in Big Science projects should contribute to socioeconomic development. Failure to demonstrate a positive impact in developmental terms, specifically within their local communities, is likely to create an existential threat for the project. The SKA project was used as a test case, wherein its socioeconomic development efforts were tested to determine their contributions to the social value of the local community.

Attaining Social Value is a dynamic and context-specific endeavour. It is dynamic in the sense that as socioeconomic conditions change, the determinants of social value will also change. In a case where a particular society is already at a significantly improved socioeconomic standing, for instance, addressing prevailing social ills towards the attainment of social value will call for higher standards in what constitutes social value in that context, thereby placing higher demands on the means towards its attainment, and the opposite will also be true. The natural conclusion following from this understanding of the dynamic nature of Social Value is that the attainment of social value should be viewed as a distant beacon guiding the trajectory of community intervention by a Big Science initiative. The objective should not be to attain ultimate social value, but to continue on a path of development towards the distant beacon.

The SKA project had identified completely different elements from those specified by the community as indicators of socioeconomic development in the area in which they operate. This observation confirmed previous findings that a disjuncture exists between what implementers of Big Science projects believe to be appropriate socioeconomic development and what local communities expect from the project. Despite the divergent beliefs in what constitutes social value at the local level, the SKA implemented a socioeconomic development

programme that was found to be benefiting the people of Carnarvon to some extent.

The concept of social value was defined in terms of humanistic principles of dignity, consultation, inclusion, and ethics. Upholding these elements to develop social value is better achieved within a social entrepreneurship setting. The investigations conducted in this study did not find any evidence of deliberate application of humanistic principles, nor did they establish any social entrepreneurship-focused implementation by the Big Science project. The suspicion is that the non-humanistic approach in the implementation of the SKA socioeconomic intervention initiatives may be responsible for the deficiency in Social Value in the area, thereby resulting in the community failing to appreciate the positive developments accruing from these initiatives.

Although this study confirms that there are positive elements of development through the implementation of the SKA project in the Carnarvon area, the sustainability of these developments could not be confirmed. In developmental terms, sustainability could be linked to the UN Sustainable Development Goals. The discussions here pointed to an alignment between Big Science activities and three of the seventeen UN Sustainable Development Goals, namely Goal 1: Eradicate extreme poverty, Goal 3: Ensure healthy lives and promote the well-being of all, and Goal 16: Promote peaceful and inclusive societies. Integrating these elements into the planning and execution of Big Science-related socioeconomic development initiatives could boost their sustainability.

The unintended use of humanistic principles within the SKA socioeconomic development initiatives which resulted in social value in Carnarvon supports the development of a standard model that could be used by Big Science projects to deliberately plan for the integration of humanistic in their project implementation process to ensure that social development that is relevant and meaningful to the local community is realised while also aligning such efforts to the SDGs to ensure the sustainability of the development. Utilising the

model will ensure the alignment of priorities while also aiding policymakers in determining appropriate funding policy for Big Science projects.

This study shows that Big Science projects can achieve definable lateral mandates in addition to their scientific objectives with deliberate effort and focused planning. This can be achieved through the integration of humanistic management principles, social entrepreneurship, and alignment with the SDGs in the delivery of their social objectives, as opposed to just anticipating social development outcomes happening by chance.

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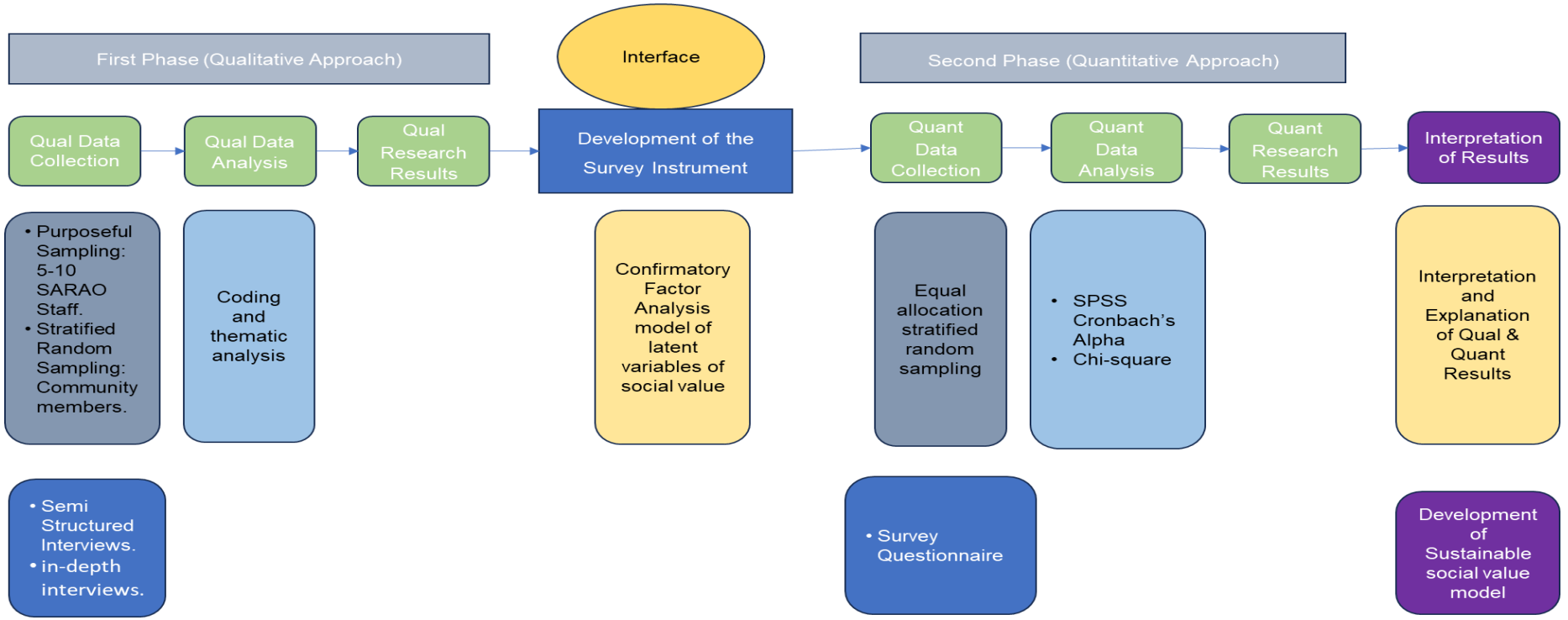
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Appendix A: Schematic Representation of the Research Process

Adapted from (Berman, 2017)



Appendix B: Semi-Structured Interview Guide

Research Topic	The role of the square Kilometre array in building socio-economic sustainability in the karoo using social entrepreneurship skills.
Interview Focus	Establishing the nature of social value in the community by identifying specific constructs that the society identifies as the identifiers of their social value.
For the record could you please tell me your name?	**The respondent's name will not be recorded to maintain anonymity.**
How long have you been residing in this town?	
What are the two things you like the most about this town, and what are the two you dislike the most?	
Are you aware of the SKA project, can you mention a few things they have done for this town?	
Have you directly participated in any of the programmes of the SKA, which one is it, can you describe what was happening in the programme?	
How would you say your participation in the programme has changed or affected your life?	
After this question, the researcher will probe and follow up to establish the following: • *The specific areas of the respondent's socioeconomic situation that have improved.* • *Specific aspects that the respondent sees as a positive change in their socioeconomic situation.* • *Specific approaches adopted by the SKA that are perceived to be contributing to positive change.* • *Aspect that the respondent feel can be added to the SKA programme to add value to the community.*	

Appendix C: Survey Questionnaire – English Version

SURVEY QUESTIONNAIRE

The Role of the Square Kilometre Array in Building Socio-Economic Sustainability in the Karoo Using Social Entrepreneurship Skills

Dear Respondent

Thank you for taking the time to participate in this research survey. There are 30 questions in total which will take you approximately 20 minutes to complete. Your feedback is important to us.

Mega infrastructure projects, such as the Square Kilometre Array (SKA), should play a role in uplifting the communities within which they operate. This study seeks to gauge the extent of social development provided by the SKA in Carnarvon and will use the outcomes of this study to develop a model that will guide similar projects on how to approach social development.

Participation in this study is voluntary, kindly note that you have the right to terminate your participation at any stage of the survey, and in that case, any information already provided will be deleted. No person's identity will be used or exposed during this study, and anonymity will be maintained. There is no right or wrong answer.

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The foregoing information about this study has been read to me. I have had the opportunity to ask questions and discuss it. I have received satisfactory answers to all my questions and I have received enough information about this study. I understand that I am free to withdraw from this study at any time without giving a reason for withdrawing and without negative consequences. I consent to the use of audio recordings for the purposes of my participation in this study. I understand that my data will remain anonymous and confidential.

• **I consent voluntarily to be a participant in this study**	☐	• **I do not consent to be a participant in this study**	☐

- **Gender:** **Male** ☐ **Female** ☐ **Other** ☐
- **Years of Age:** ☐
- **Race** ***(for statistical purposes only):*** **Black** ☐ **Coloured** ☐ **White** ☐ **Other** ☐

QUESTIONNAIRE INSTRUCTIONS

- Please answer each question by making a selection next to the option of your choice.
- Please answer the questions as honestly as possible.
- Please do not ask for any assistance to answer the questions.
- Please answer all the questions for the survey to be valid.
- The questionnaire will take a maximum of 20 minutes to complete

1. How far do you agree or disagree with each of the following statements as they relate to the area where you live?

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1.1 I know a lot of people who got employed at the SKA project.					
1.2 The presence of the SKA has improved my quality of life.					
1.3 Many programmes that assist people have been implemented in my community by the SKA.					
1.4 I feel that the presence of the SKA has a positive effect on my life in general.					
1.5 Without the SKA project the town would be in a worse condition today.					

2. How far do you agree or disagree with each of the following statements regarding your interaction with the SKA project?

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
2.1 The SKA staff always consults with the community before implementing any community projects.					
2.2 The SKA staff are always willing to consider my views when implementing community projects.					
2.3 I always feel free to express my views regarding community projects implemented by the SKA.					
2.4 I feel proud about the community programmes being implemented in my community.					
2.5 I think the presence of the SKA project has improved the lives of people in this town.					

3. **How far do you agree or disagree with each of the following changes in your area brought about by the SKA project?**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
3.1 The condition of the town has improved significantly since the start of the SKA project					
3.2 I have seen an improvement in services since the start of the SKA project.					
3.3 The people in my town are benefiting from the SKA project.					
3.4 The SKA project is helping to improve the conditions in my town.					
3.5 The community programmes implemented by the SKA bring dignity to the people of this town.					

4. **How far do you agree or disagree with each of the following statements as they relate to the staff of the SKA?**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
4.1 I always feel respected when I interact with SKA staff.					
4.2 The community programmes implemented by the SKA staff are relevant to my needs.					
4.3 The community programmes implemented by the SKA add value to the people of my town.					
4.4 I am happy with all the programmes being implemented by the SKA in my town.					
4.5 I feel safe living in this town since the start of the SKA project.					

5. **How far do you agree or disagree with each of the following statements as they relate to your relationship with SKA staff?**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

5.1 I trust the SKA staff who are implementing socioeconomic programmes in the town.					
5.2 The SKA staff implementing socioeconomic programmes in my town are always ethical and act with integrity.					
5.3 I always feel free to discuss my needs with SKA staff.					
5.4 The SKA Staff working in this town are always honest and open to the people.					
5.5 The SKA staff always treat all residents equally.					

6. **How far do you agree or disagree with each of the following statements as they relate to the Community Development programmes of the SKA?**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
6.1 The staff of the SKA have Ubuntu.					
6.2 The staff of SKA always consult with the public when they want to do things in the town.					
6.3 The SKA staff always treat everybody with dignity.					
6.4 The SKA staff working in Carnarvon always act with ethics and integrity.					
6.5 All groups of people are treated equally by the SKA staff.					

Appendix D: Survey Questionnaire – Afrikaans Version

OPNAME VRAELYS

Die Rol van die Square Kilometre Skikking in die Bou van Sosio-ekonomiese Volhoubaarheid in die Karoo Met behulp van Sosiale Entrepreneurskap Vaardighede

Geagte Respondent

Dankie dat jy die tyd geneem het om aan hierdie navorsingsopname deel te neem. Daar is altesaam 30 vrae wat jou ongeveer 20 minute sal neem om te voltooi. Jou reaksie is vir ons belangrik.

Mega-infrastruktuurprojekte, soos die Square Kilometre Array (SKA), behoort 'n rol te speel in die opheffing van die gemeenskappe waarbinne hulle bedrywig is. Hierdie studie poog om die omvang van sosiale ontwikkeling wat deur die SKA in Carnarvon verskaf word, te bepaal en sal die uitkomste van hierdie studie gebruik om 'n model te ontwikkel wat soortgelyke projekte sal rig oor hoe om sosiale ontwikkeling te benader.

Deelname aan hierdie studie is vrywillig, sal asseblief daarop dat u die reg het om u deelname op enige stadium van die opname te beëindig, en in daardie geval sal enige inligting wat reeds verskaf is, uitgevee word. Geen persoon se identiteit sal tydens hierdie studie gebruik of blootgestel word nie, en anonimiteit sal gehandhaaf word. Daar is geen regte of verkeerde antwoorde nie.

Kontakbesonderhede:

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Toesighoudende Naam: Dr Raimi Lukman
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Die voorafgaande inligting oor hierdie studie is vir my gelees. Ek het die geleentheid gehad om vrae te vra en dit te bespreek. Ek het bevredigende antwoorde op al my vrae ontvang en ek het genoeg inligting oor hierdie studie ontvang. Ek verstaan dat ek vry is om te eniger tyd aan hierdie studie te onttrek sonder om 'n rede te gee vir onttrekking en sonder negatiewe gevolge. Ek stem in tot die gebruik van klankopnames vir die doeleindes van my deelname aan hierdie studie. Ek verstaan dat my data anoniem en vertroulik sal bly.
• **Ek stem vrywillig in om deel te wees van hierdie studie** ☐ • **Ek stem nie in om 'n deelnemer aan hierdie studie te wees nie** ☐
• **Geslag: Man** ☐ **Vroulike** ☐ **Ander** ☐ • **Ouderdom:** ☐ • **Ras (slegs vir statistiese doeleindes): Swart** ☐ **Kleurling** ☐ **Wit** ☐ **Ander** ☐

VRAELYS INSTRUKSIES

- Beantwoord asseblief elke vraag deur 'n keuse langs die opsie van jou keuse te maak.
- Beantwoord asseblief die vrae so eerlik moontlik.
- Moet asseblief nie vir enige hulp vra om die vrae te beantwoord nie.
- Beantwoord asseblief al die vrae vir die opname om geldig te wees.
- Die vraelys sal 'n maksimum van 20 minute neem om te voltooi.

1. Hoe ver stem jy saam of stem jy nie saam met elk van die volgende stellings nie, aangesien dit verband hou met die area waar jy woon?

	Sterk saamstem	Saamstem	Neutrale	Verskil	Sterk verskil
1.1 Ek ken baie mense wat by die SKA-projek werksaam was.					
1.2 Die teenwoordigheid van die SKA het my lewenskwaliteit verbeter.					
1.3 Baie programme wat mense bystaan, is deur die SKA in my gemeenskap geïmplementeer.					
1.4 Ek voel dat die teenwoordigheid van die SKA 'n positiewe uitwerking op my lewe in die algemeen het.					
1.5 Sonder die SKA-projek sou die dorp vandag in ’n slegter toestand wees.					

2. Hoe ver stem jy saam of stem jy nie saam met elk van die volgende stellings oor jou interaksie met die SKA-projek nie?

	Sterk saamstem	Saamstem	Neutrale	Verskil	Sterk verskil
2.1 Die SKA-personeel konsulteer altyd met die gemeenskap voordat enige gemeenskapsprojekte geïmplementeer word.					
2.2 Die SKA-personeel is altyd bereid om my sienings te oorweeg wanneer hulle gemeenskapsprojekte implementeer.					
2.3 Ek voel altyd vry om my sienings uit te spreek oor gemeenskapsprojekte wat deur die SKA geïmplementeer is.					
2.4 Ek voel dat die teenwoordigheid van die SKA die lewens van mense verbeter het.					
2.5 Ek dink die teenwoordigheid van die SKA-projek het die lewens van mense in hierdie dorp verbeter.					

3. Hoe ver stem jy saam of stem jy nie saam met elk van die volgende veranderinge in jou gebied wat deur die SKA-projek teweeggebring word nie

	Sterk saamstem	Saamstem	Neutrale	Verskil	Sterk verskil
3.1 Die toestand van die dorp het aansienlik verbeter sedert die begin van die SKA-projek.					
3.2 Ek het sedert die begin van die SKA-projek 'n verbetering in dienste gesien.					
3.3 Die mense in my dorp trek voordeel uit die SKA-projek.					
3.4 Die SKA-projek help om die toestande in my dorp te verbeter.					
3.5 Die gemeenskapsprogramme wat deur die SKA geïmplementeer word, bring waardigheid aan die mense van hierdie dorp.					

4. Hoe ver stem jy saam of stem jy nie saam met elk van die volgende stellings nie, aangesien dit verband hou met die personeel van die SKA?

	Sterk saamstem	Saamstem	Neutrale	Verskil	Sterk verskil
4.1 Die toestand van die dorp het aansienlik verbeter sedert die begin van die SKA-projek.					
4.2 Die gemeenskapsprogramme wat deur die SKA-personeel geïmplementeer word, is relevant vir my behoeftes.					
4.3 Die gemeenskapsprogramme wat deur die SKA geïmplementeer word, voeg waarde toe aan die mense van my dorp.					
4.4 Ek is tevrede met al die programme wat deur die SKA in my dorp geïmplementeer word.					
4.5 Ek voel veilig om in hierdie dorp te woon sedert die begin van die SKA-projek.					

5. Hoe ver stem jy saam of stem jy nie saam met elk van die volgende stellings nie, aangesien dit verband hou met jou verhouding met SKA-personeel?

	Sterk saamstem	Saamstem	Neutrale	Verskil	Sterk verskil
5.1 Ek vertrou die SKA-personeel wat sosio-ekonomiese programme in die dorp implementeer.					
5.2 Die SKA-personeel wat sosio-ekonomiese programme in my dorp implementeer, is altyd eties en tree met integriteit op.					
5.3 Ek voel altyd vry om my behoeftes met SKA-personeel te bespreek.					

5.4 Die SKA-personeel wat in hierdie dorp werk, is altyd eerlik en oop vir die mense.					
5.5 Die SKA-personeel behandel alle inwoners altyd gelyk.					

6. Hoe ver stem jy saam of stem jy nie saam met elk van die volgende stellings nie, aangesien dit verband hou met die Gemeenskapsontwikkelingsprogramme van die SKA?

	Sterk saamstem	Saamstem	Neutrale	Verskil	Sterk verskil
6.1 Die personeel van die SKA het Ubuntu.					
6.2 Die personeel van SKA raadpleeg altyd die publiek wanneer hulle programme in dir dorp moet implementeer.					
6.3 Die SKA-personeel behandel die mense van die dorp met waardigheid.					
6.4 Die SKA-personeel wat in die dorp werk, tree altyd op met etiek en integriteit.					
6.5 Alle groepe mense word gelyk behandel deur die SKA-personeel.					

Appendix E: Random Samples for the Qualitative Study

1. Random Sample in the Carnarvon Town Area (Tier 1)

Results of the Simple Random Sampling Applet:

Population Size: N = 624
Sample Size: n = 48

221, 204, 490, 111, 487, 489, 429, 470, 415, 358,
119, 138, 214, 118, 206, 478, 388, 526, 619, 061,
128, 293, 030, 090, 059, 504, 009, 203, 377, 367,
456, 466, 486, 482, 114, 588, 284, 308, 562, 580,
190, 044, 229, 262, 072, 257, 436, 538

2. Random Sample Bonteheuwel (Tier 2)

Results of the Simple Random Sampling Applet:

Population Size: N = 965
Sample Size: n = 74

267, 901, 524, 114, 637, 095, 235, 221, 129, 890,
400, 453, 580, 791, 459, 673, 392, 307, 660, 144,
317, 308, 787, 324, 543, 383, 841, 921, 792, 254,
216, 748, 275, 448, 867, 639, 648, 245, 628, 684,
179, 214, 325, 073, 338, 474, 655, 641, 915, 437,
126, 421, 925, 406, 457, 492, 412, 928, 742, 205,
083, 766, 594, 409, 168, 413, 382, 892, 722, 313,
885, 823, 622, 343

3. Random Sample in Die Bult (Tier 3)

Results of the Simple Random Sampling Applet:

Population Size: N = 37
Sample Size: n = 4

25, 07, 29, 09

Appendix F: UREC Ethics Approval

UNICAF UNIVERSITY

UREC Decision, Version 2.0

Unicaf University Research Ethics Committee Decision

Student's Name:	Hubert Mathebula
Student's ID #:	R2104D12079591
Supervisor's Name:	Dr Lukman Raimi
Program of Study:	UU-PhD-BA-900-3
OfferID / GroupID:	O59550G61022
Dissertation stage:	DS3
Research Project Title:	THE ROLE OF THE SQUARE KILOMETRE ARRAY IN BUILDING SOCIO-ECONOMIC SUSTAINABILITY IN THE KAROO USING SOCIAL ENTREPRENEURSHIP SKILLS
Ethical conditions for approval:	No comments.
Methodological recommendations:	
Decision*:	A. Approved without revision or comments
Date:	December 12, 2023

*Provisional approval provided at the Dissertation Stage 1, whereas the **final** approval is provided at the Dissertation stage 3. The student is allowed to proceed to data collection following the final approval.

Appendix G: Informed Consent Form

UNICAF UNIVERSITY

UU_IC - Version 2.1

Informed Consent Form

Part 1: Debriefing of Participants

Student's Name: Hubert Mathebula

Student's E-mail Address: mbhinyi.kuliki@gmail.com

Student ID #: R2104D12079591

Supervisor's Name: DR Raimi Lukman

University Campus: Unicaf University Malawi (UUM)

Program of Study: Doctor of Philosophy (Ph.D.) in Business Administration

Research Project Title: THE ROLE OF THE SQUARE KILOMETRE ARRAY IN BUILDING SOCIO-ECONOMIC SUSTAINABILITY IN THE KAROO USING SOCIAL ENTREPRENEURSHIP SKILLS

Date: 03-Nov-2023

Provide a short description (purpose, aim and significance) of the research project, and explain why and how you have chosen this person to participate in this research (maximum 150 words).

The purpose of the study is to determine the nature of social value created by the implementation of the SKA project in Carnarvon, from the perspective of the people of Carnarvon. To further determine the extent of the value and its sustainability. The study will further integrate the elements describing the nature of the social value with the sustainability indicators to create a model that will inform the interactions between large-scale science infrastructure projects such as the SKA and communities depending on them for their development.

You have been selected as an adult member of the community of Carnarvon to participate in the study. The researcher will conduct a face-to-face interview with you to obtain your opinion about the role of the SKA project in the community of Carnarvon. The interview will take a maximum of an hour.

The above named student is committed to ensuring participant's voluntarily participation in the research project and guaranteeing there are no potential risks and/or harms to the participants.

Participants have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In these cases, data collected will be deleted.

All data and information collected will be coded and will not be accessible to anyone outside this research. Data described and included in dissemination activities will only refer to coded information ensuring beyond the bounds of possibility participant identification.

I, Hubert Mathebula, **ensure that all information stated above is true and that all conditions have been met.**

Student's Signature: HS Mathebula

UU_IC - Version 2.1

Informed Consent Form

Part 2: Certificate of Consent

This section is mandatory and should to be signed by the participant(s)

Student's Name: Hubert Mathebula

Student's E-mail Address: mbhinyi.kuliki@gmail.com

Student ID #: R2104D12079591

Supervisor's Name: DR Raimi Lukman

University Campus: Unicaf University Malawi (UUM)

Program of Study: Doctor of Philosophy (Ph.D.) in Business Administration

Research Project Title: THE ROLE OF THE SQUARE KILOMETRE ARRAY IN BUILDING SOCIO-ECONOMIC SUSTAINABILITY IN THE KAROO USING SOCIAL ENTREPRENEURSHIP SKILLS

I have read the foregoing information about this study, or it has been read to me. I have had the opportunity to ask questions and discuss about it. I have received satisfactory answers to all my questions and I have received enough information about this study. I understand that I am free to withdraw from this study at any time without giving a reason for withdrawing and without negative consequences. I consent to the use of multimedia (e.g. audio recordings, video recordings) for the purposes of my participation in this study. I understand that my data will remain anonymous and confidential, unless stated otherwise. I consent voluntarily to be a participant in this study.

Participant's Print name: _____

Participant's Signature: _____

Date:

If the Participant is illiterate:

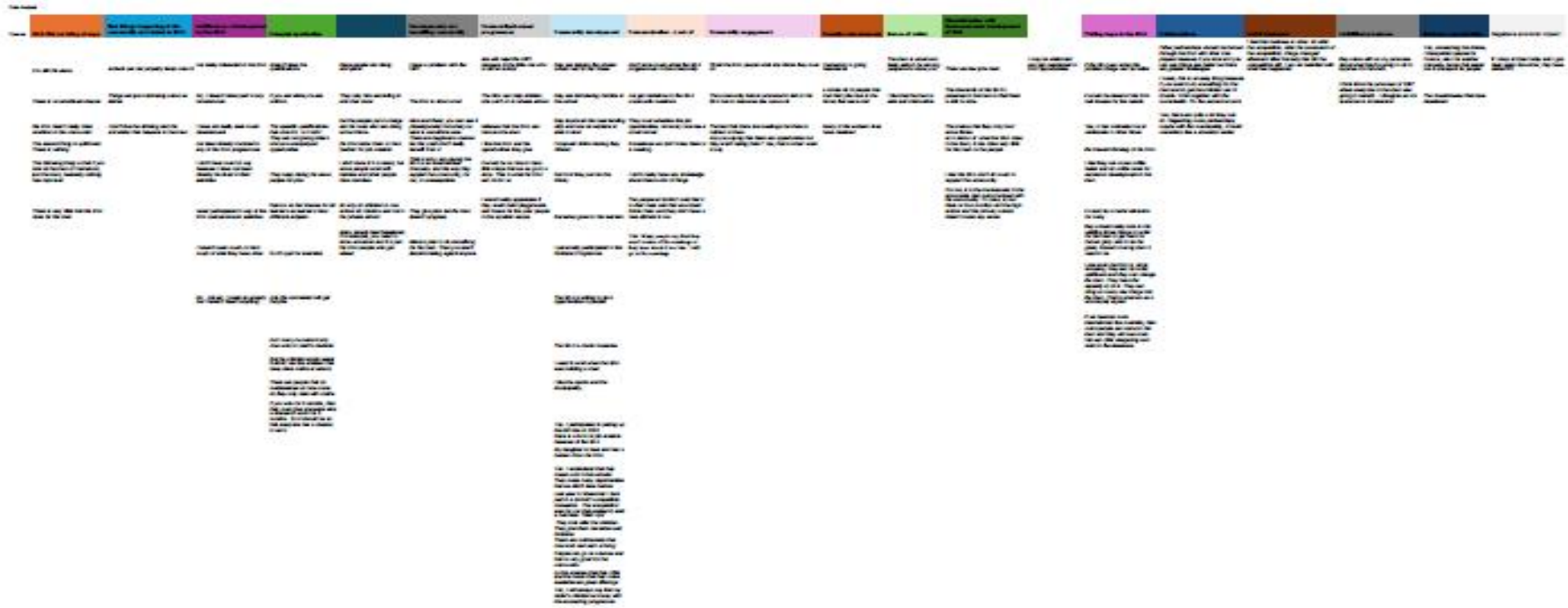
I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had an opportunity to ask questions. I confirm that the aforementioned individual has given consent freely.

Witness's Print name: _____

Witness's Signature: _____

Date:

Appendix H: The Coding Process



Appendix I: Cronbach's Alpha Results for the Survey Questionnaire

Reliability Test – Overall reliability rating = 0,879

Item 1: Conditions in the town of Carnarvon

Reliability Statistics

Cronbach's Alpha	N of Items
,828	5

Case Processing Summary

		N	%
Cases	Valid	5	100,0
	Excluded[a]	0	,0
	Total	5	100,0

a. Listwise deletion based on all variables in the procedure.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
More people getting employment	9,80	3,700	,930	,685
Quality of life has improved	9,40	7,300	,083	,895
Many community upliftment programmes implemented	9,80	4,700	,567	,823
SKA has improved the lives of people	10,20	4,700	,815	,738
Without SKA town would be worse	9,60	5,300	,833	,755

Item 2: Community Interactions with SKA

Reliability Statistics

Cronbach's Alpha	N of Items
,922	5

Case Processing Summary

		N	%
Cases	Valid	5	100,0
	Excluded[a]	0	,0
	Total	5	100,0

a. Listwise deletion based on all variables in the procedure.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SKA Staff consults with the community	8,60	14,800	,668	,928
Views of the community are considered	8,40	11,300	,850	,897
Community members are free to express their views	8,40	12,300	,927	,878
Proud of community programmes	8,20	14,700	,686	,925
SKA project has improved lives	8,00	11,500	,905	,881

Item 3: Effects of the SKA project in Carnarvon

Case Processing Summary

		N	%
Cases	Valid	5	100,0
	Excluded[a]	0	,0
	Total	5	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,920	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
More people getting employment	13,40	13,800	,767	,906
Condition of the town has improved	12,80	15,200	,725	,913
Improvement in services	12,60	16,800	,736	,923
People are benefiting	13,20	11,700	,859	,897
SKA helping to improve conditions	13,20	11,200	,943	,882
Community programmes bring dignity to the people	13,80	14,700	,830	,901

Item 4: Effect of Community Programmes

Case Processing Summary

		N	%
Cases	Valid	5	100,0
	Excluded[a]	0	,0
	Total	5	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,747	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I trust the SKA staff	7,80	7,700	,921	,866
The SKA staff are ethical and have integrity	8,20	9,200	,906	,870
I am free to discussmy needs with staff	8,00	8,500	,857	,878
I think the SKA staff are always honest and open	8,00	10,500	,764	,902
The SKA staff treat everybody the same	8,00	11,500	,521	,939

Item 5: Trust Worthiness Ethics

Case Processing Summary

		N	%
Cases	Valid	5	100,0
	Excluded[a]	0	,0
	Total	5	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,914	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I feel respected when interacting with SKA staff	10,00	6,000	,732	,622
Community programmes are relevant to needs of the community	9,40	8,300	,116	,835
Community programmes add value	9,20	6,700	,952	,617
I am Happy with all programmes implemented	9,40	5,300	,874	,553
I feel safe living in Carnarvon	9,20	6,700	,288	,816

Item 6: Community relations

Case Processing Summary

		N	%
Cases	Valid	5	100,0
	Excluded[a]	0	,0
	Total	5	100,0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
,940	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Staff have ubuntu	7,80	8,700	,836	,935
the staff of SKA always consult the public	8,40	6,800	,963	,902
Staff treat people with dignity.	8,20	8,200	,741	,943
Staff acts with honesty and integrity	8,40	6,800	,963	,902
All groups are treated equally	8,00	7,500	,764	,942

Appendix J: Descriptive Statistics – Survey Data

	N	Minimum	Maximum	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Item 1	118	1	5	-1.123	.442
Valid N (listwise)	118				

	N	Minimum	Maximum	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Item 2	118	1	5	-.991	.442
Valid N (listwise)	118				

	N	Minimum	Maximum	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Item 3	118	1	5	-1.286	.442
Valid N (listwise)	118				

	N	Minimum	Maximum	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Item 4	118	1	5	-1.195	.442
Valid N (listwise)	118				

	N	Minimum	Maximum	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error

Item 5	118	1	5	-1.102	.442
Valid N (listwise)	118				

	N Statistic	Minimum Statistic	Maximum Statistic	Kurtosis Statistic	Std. Error
Item 6	118	1	5	-1.150	.442
Valid N (listwise)	118				

Appendix K: Descriptive Statistics – Survey Data

	N	Minimum	Maximum	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Item 1	118	1	5	-1.123	.442
Valid N (listwise)	118				

	N	Minimum	Maximum	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Item 2	118	1	5	-.991	.442
Valid N (listwise)	118				

	N	Minimum	Maximum	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Item 3	118	1	5	-1.286	.442
Valid N (listwise)	118				

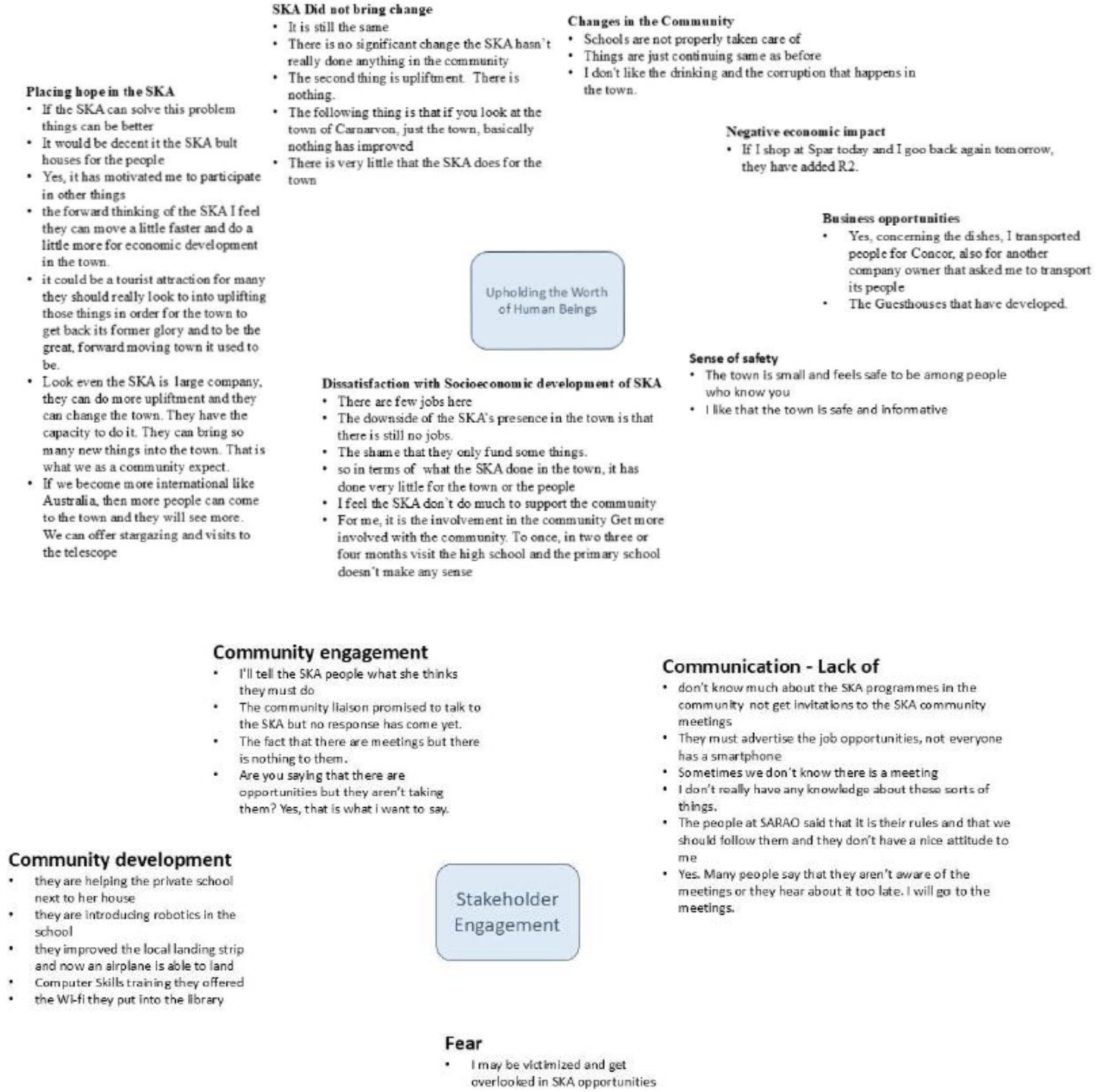
	N	Minimum	Maximum	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Item 4	118	1	5	-1.195	.442
Valid N (listwise)	118				

	N	Minimum	Maximum	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error

Item 5	118	1	5	-1.102	.442
Valid N (listwise)	118				

	N Statistic	Minimum Statistic	Maximum Statistic	Kurtosis Statistic	Std. Error
Item 6	118	1	5	-1.150	.442
Valid N (listwise)	118				

Appendix L: Development of Themes



Unfair treatment

- I feel like business is done. So after the competition, after the conclusion of the competition, things changed afterward after the lady that did the competition left.
- I am not satisfied with what has happened.

Ubuntu

Negative development

- Carnarvon is going backwards
- a whole lot of people that lost their jobs due to the farms that were sold
- Many of the workers lives have declined

Developments not benefiting community

- I heve a problem with the WiFi
- The SKA is doing good here and there, you can see it (development) but what you want is something else
- There are beginners courses but the youth don't really benefit from it. That is why I am saying the SKA is an international Company and the way they support the community, for me, is unacceptable.
- They give jobs but the town doesn't progress
- Make a plan to do something for the town, then you aren't discriminating against anyone.

Not Impacted by SKA

- Not really interested in the SKA
- No, I haven't taken part in any programmes.
- I have not really seen much development
- Not been directly involved in any of the SKA programmes
- I don't have much to say because I have not been directly involved in their activities, never participated in any of the SKA socioeconomic activities
- I haven't seen much or herd much of what they have done
- No , not yet. I made an enquiry but I haven't heard anything.

Dignified Approaches

Community-focused programmes

- She will need the WIFI because of the little one who is still at school
- The SKA can help children who can't go to private school
- believes that the SKA can improve the town
- I like the SKA and the opportunities they give
- It would be so nice to have little shops that we ca go to a shop. That is what the SKA can do for us.
- I would really appreciate if they could build playgrounds and house for the poor people in the squatter camps.

Unfulfilled promises

- They came with so my promises about what they're going to do to improve for the town.
- I think the promises of 2007 where everyone in the town was going to benefit. I disagree as not everyone is progressing

Ethics, Integrity & Trustworthiness

Unethical behaviour

- Those people are doing corruption
- They only hire according to who they know but the people put in charge are the ones who are doing wrong things.
- the SKA allow them to form 'parties' for job creation
- I don't know if it is racist, but some people work with bakkies and other people have kombies.
- So why do children in one school do robotics and not in the private school
- Many people feel threatened, For example, you need to know someone and it is just the SKA people who get ahead.

Unequal opportunities

- If you doesn't have the qualifications, if you are white you are nothing.
- The specific qualifications they look for is matric
- They are not giving others who are unemployed opportunities
- They keep taking the same people for jobs
- there is no fair chance for all learners as learners have different subjects
- So it's just for scientists
- only the connected will get the jobs
- but I mean you cannot only give work to math's students
- But the children which assist SARAO are the children that have done maths at school
- There are people that do maintenance so how come do they only deal with maths.
- If you wok for 6 months, then they must give someone else a chance to work for 6 months. So it should be so that everyone has a chance to work

Protection of Vulnerable Groups

Collaborations

- Other partnerships should be formed through the SKA with other role players because if you look at it you can see things are better but there are greater challenges
- I mean, this is an easy thing because if you want to do something for the town and to get the children out of trouble. Work together with the municipality. Fix the swimming pool.
- Yes, there are quite a lot they can do. Regarding more partnerships, maybe with the municipality, to build something like a shopping center.

Appendix M: REAF Form



UNICAF UNIVERSITY
RESEARCH ETHICS APPLICATION FORM
DOCTORAL STUDIES PROVISIONAL APPROVAL

The Provisional Approval - Research Ethics Application Form (REAF) should be completed by Doctoral level candidates enrolled on Dissertation stage 1.

This form is a **provisional approval** which means that the UREC committee has accepted the initial description of the project but this is conditional as changes may have to be implemented following Dissertation Stage 2 and piloting in Dissertation Stage 3.

This is a conditional offer and acceptance of the project needs to be verified and confirmed upon completion of the Research Ethics Application Form in Dissertation Stage 3.

Important Notes:

- An electronic version of the completed form should be uploaded by the student to the relevant submission link in the VLE. Student's supervisor will then review the form and provide feedback commentary. Once supervisor's initial approval is given then the supervisor will forward this to doctoral.studies-aa@unicaf.org, for provisional approval by the Unicaf University Research Ethics Committee (UREC).
- Please type your answers and **do not** submit paper copy scans. Only *PDF* format documents should be submitted to the committee. It is recommended to use free version of Adobe Acrobat Reader available online: https://get.adobe.com/reader/
- If you need to supply any supplementary material, not specifically requested by the application form, please do so in a separate file. Any additional document(s) should be clearly labelled and uploaded in the relevant VLE link.
- If you have any queries about the form, please address them to your dissertation or project supervisor.

UNICAF UNIVERSITY

REAF_DSPA - Version 1.0 AP

UNICAF UNIVERSITY
RESEARCH ETHICS APPLICATION FORM
DOCTORAL STUDIES PROVISIONAL APPROVAL

UREC USE ONLY:
Application No
Date Received

Student's Name: Hubert Mathebula

Student's E-mail Address: mbhinyi.kuliki@gmail.com

Student's ID #: R2104D12079591

Supervisor's Name: Dr Raimi Lukman

University Campus: Unicaf University Malawi (UUM)

Program of Study: UUM: PhD Doctorate of Philosophy - Business Administration

Research Project Title: The Role of the SKA project in Building Socioeconomic Sustainability in the Karoo using Social Entreprenuereship Skills.

1. **Please state the timelines involved in the proposed research project:**

Estimated Start Date: 01-Sep-2023 Estimated End Date: 30-Nov-2023

2. **The research project**

2a.Project Summary:

In this section please fully describe the purpose and underlying rationale for the proposed research project. Ensure that you pose the research questions to be examined, state the hypotheses, and discuss the expected results of your research and their potential.
It is important in your description to use plain language so it can be understood by all members of the UREC, especially those who are not necessarily experts in the particular discipline. To that effect please ensure that you fully explain / define any technical terms or discipline-specific terminology (maximum 300 words +/- 10%).

This study aims to contribute to knowledge in the area of social value in large science infrastructure projects. The study will use the Square Kilometer Array (SKA) project to test how large infrastructure projects can contribute to sustainable social development through the incorporation of humanistic management principles in the context of social entrepreneurship. Mega infrastructure projects, by their nature and intention, should result in some form of social development. This could be in the form of creating permanent employment opportunities, providing or improving essential social services, and improving facilities and resources that will benefit the community and enhance access to opportunities. Some of these positive outcomes respond directly to the UN Global Sustainable Development Goals (SDGs). However, scientific infrastructure such as research laboratories and mega telescopes, by their nature, are not inclined to respond to community needs. Their mandate is to enhance knowledge creation, while some of their benefits could include elevating the status of the host country as a significant player in global research. In cases where such projects are financed through public funds, as is the case with the SKA project, it would be crucial to have a strong justification to fund such a vanity project at the expense of pressing public The purpose of this study thereof is to design a framework, using the SKA project in South Africa, that will guide the integration of sustainable social value as an additional mandate in the implementation of large scale science infrastructure projects. It is hypothesised that social entrepreneurship, as a vehicle for the use of humanistic management principles, when integrated into social development initiatives can bring about sustainable social value, as such the framework will help these projects to infuse social entrepreneurship in the social development initiatives. The study aims to achieve this by answering the following three research questions: (1) What social value has the implementation of the SKA created its vicinity?; (2) What are the sustainability indicators of this social value?; and (3) How can the SKA project apply humanistic management principles in its socioeconomic initiatives to achieve sustainable social value?

2b. Significance of the Proposed Research Study and Potential Benefits:

Outline the potential significance and/or benefits of the research (maximum 200 words).

This study contributes to the body of knowledge in the research areas of humanistic management principles applied within social entrepreneurship, and the developmental impact of scientific infrastructure, specifically the SKA. Humanistic management offers an alternative business management approach that prioritises the well-being of the individual and the collective over mechanistic profit-driven approaches. As such, a business model that intends to positively contribute to the well-being of society would achieve better results if based on humanistic management principles implemented through social entrepreneurship. This research hopes to guide the management of large-scale scientific projects to effectively implement these principles within the communities in which they are based.
Furthermore, this research aims to link the developmental objectives of large-scale infrastructure projects to the SDGs as part of their social development mandate. This will invariably enhance the legitimacy and acceptability of scientific projects, which are conceptualised on knowledge development objectives, at the local grass roots level where interest in scientific knowledge may be absent or even meaningless. This study will further contribute to public funding policy, enhanced project management approaches, and contribute to the development and enhancement of social relations between communities and public funded projects.

3. **Project execution:**

3a. Type of project. The following study is an:

- [x] experimental study (primary research)
- [ ] desktop study (secondary research)
- [ ] desktop study using existing databases involving information of human/animal subjects
- [x] Other

If you have chosen 'Other' please Explain:

This study will also observe business management activities within their natural setting and recording of an occurrence diary.

3b. Methods. The following study will involve the use of:

Method	Materials / Tools
☑ Qualitative	☑ Face to Face Interviews
	☐ Phone Interviews
	☐ Face to Face Focus Groups
	☐ Online Focus Groups
	☑ Other*
☑ Quantitative	☑ Self-administered Questionnaires
	☐ Online Questionnaires
	☐ Experiments
	☐ Tests
	☑ Other *

*If you have chosen 'Other' please Explain:

Non-participatory observations.

4. **Participants**

4a. Does the Project involve the recruitment of participants?

☑ YES **If YES, please complete all following sections.**

☐ NO **If NO, please directly proceed to Question 5.**

Note: The definition of "participation" includes active participation, such as when participants knowingly take part in an interview or complete a questionnaire.

4b. Relevant Participant Details of the Proposed Research

Please state the number of participants you plan to recruit, and describe important characteristics such as: demographics (e.g. age, gender, location, affiliation, level of fitness, intellectual ability etc). It is also important that you specify any inclusion and exclusion criteria that will be applied (e.g. eligibility criteria for participants).

Number of participants: 800

Age range: From 18 To 65

Gender: ☑ Female ☑ Male

Eligibility Criteria:

- Inclusion criteria: 1. SARAO employees 18 working in the Social Development Unit in the organisation. 2. Community members in Carnarvon 250, Williston 120, Vanwyksvlei 200, Brandvlei 200. 3. identified SMMEs 12.

- Exclusion criteria: People residing in other communities in the Karoo, people younger or older than the identified age range and SARAO employees in other sections other than the Social Development Unit.

Disabilities: Mentally disabled individuals will not participate in this study.

Other relevant information (maximum 100 words):

The SARAO is composed of various units responsible for different functions, such as engineering, procurement, maintenance, product development, etc. One of the units is the Social Development unit responsible for the social development functions of the organisation.

4c. Recruitment Process for Human Research Participants:

Please clearly describe how the potential participants will be identified, approached and recruited (maximum 200 words).

This study will involve three different groups of participants. The first group is the SARAO employees who work specifically in the social development unit within the organization. The SARAO Human Resource Manager will be approached to request permission to contact these employees via E-mail, their email addresses and contact telephone numbers will be obtained from the HRM unit. Emails to request their participation will be sent to the identified staff and follow up by phone calls to confirm their participation and complete all relevant processes necessary to begin with the data collection.

The second group consist of community members who will be identified through a random sampling process and approached in person to request their participation. Municipal records obtained from the local municipal office will be used to obtain population numbers that will inform the sample size.

The third group consist of small businesses that are part of the SARAO enterprise development programme. Their list and contacts will be obtained from SARAO unit responsible for social development.

4d. Relationship between the principal investigator and participants:

Is there any relationship between the principal investigator (student), co-investigators(s), (supervisor) and participant(s)? For example, if you are conducting research in a school environment on students in your classroom (e.g. instructor-student).

☐ YES ☑ NO

If YES, please specify (maximum 100 words).

5. Further Approvals

Are there any other approvals required (in addition to ethics clearance from UREC) in order to carry out the proposed research study?

☐ YES ☑ NO

If YES, please specify (maximum 100 words).

6. **Potential Risks of the Proposed Research Study**

Are there any potential risks, psychological harm and/or ethical issues associated with the proposed research study, other than risks pertaining to everyday life events (such as the risk of an accident when travelling to a remote location for data collection)?

☐ YES ☑ NO

If YES, please specify (maximum 150 words):

7. **Application Checklist**

Please mark √ if the study involves any of the following:

☐ Children and young people under 18 years of age, vulnerable population such as children with special educational needs (SEN), racial or ethnic minorities, socioeconomically disadvantaged, pregnant women, elderly, malnourished people, and ill people.

☐ Research that foresees risks and disadvantages that would affect any participant of the study such as anxiety, stress, pain or physical discomfort, harm risk (which is more than is expected from everyday life) or any other act that participants might believe is detrimental to their wellbeing and / or has the potential to / will infringe on their human rights / fundamental rights.

☐ Risk to the well-being and personal safety of the researcher.

☐ Administration of any substance (food / drink / chemicals / pharmaceuticals / supplements / chemical agent or vaccines or other substances (including vitamins or food substances) to human participants.

☐ Results that may have an adverse impact on the natural or built environment.

8. Final Declaration by Applicants:

(a) I declare that this application is submitted on the basis that the information it contains is confidential and will only be used by Unicaf University and Unicaf University Research Ethics Committee (UREC) for the explicit purpose of ethical review and monitoring of the conduct of the research proposed project as described in the preceding pages.

(b) I understand that this information will not be used for any other purpose without my prior consent, excluding use intended to satisfy reporting requirements to relevant regulatory bodies.

(c) The information in this form, together with any accompanying information, is complete and correct to the best of my knowledge and belief and I take full responsibility for it.

(d) I undertake to abide by the highest possible international ethical standards governing the Code of Practice for Research Involving Human Participants, as published by the UN WHO Research Ethics Review Committee (ERC) on http://www.who.int/ethics/research/en/ and to which Unicaf University aspires to.

(e) In addition to respect any and all relevant professional bodies' codes of conduct and/or ethical guidelines, where applicable, while in pursuit of this research project.

(f) I understand it is my responsibility to submit a full REAF application during Dissertation Stage 3 to UREC. If a REAF application is not submitted my project is not approved by UREC.

(g) I fully acknowledge that this form does not constitute approval of the proposed project but it is only a provisional approval.

☑ **I agree with all points listed under Question 8**

Student's Name: Hubert Mathebula

Supervisor's Name: Dr Raimi Lukman

Date of Application: 21-Oct-2022

Important Note:
Please now save your completed form (we suggest you also print a copy for your records) and then submit it to your UU Dissertation/project supervisor (tutor). **In the case of student projects, the responsibility lies with the Faculty Dissertation/Project Supervisor.** If this is a student application, then it should be submitted via the relevant link in the VLE. Please submit only electronically filled in copies; **do not** hand fill and submit scanned paper copies of this application.

☑ **Before submitting your application, please tick this box to confirm that all relevant sections have been filled in and the information contained is accurate to the best of your knowledge.**

Appendix N: Gatekeeper Authorisation

UNICAF UNIVERSITY

UU_GL - Version 2.0

Gatekeeper letter

Institution / Organization : Kareeberg Municipality

Address: Carnarvon

Date: 08-Jan-2024

Subject: SKA related research in Carnarvon

– approval is hereby granted

Manuel 18/12/2025

Dear Mr Faried Manuel

I am a **doctoral** student at UNICAF University **Malawi** Campus.

As part of my degree I am carrying out a study on **the role of the SKA in building sustainable social value in Carnarvon.**

I am writing to enquire whether you would be willing to give me **permission to recruit participants who will participate in face to face interviews** in this research.

I specifically request that you grant me permission to access Municipal records of households in Carnarvon for the selection of participation in this study.

The Unicaf Research Ethics Committee (UREC) has approved that I conduct **face-to-face interviews using a semi-structured questionnaires to collect data from the heads of households in Carnarvon.**

The purpose of my research is to determine the nature of social value from the perspective of the people of Carnarvon and to gauge the extent and stainability of the identified social value. Members of the public will be interviewed and also asked to complete a survey.

Thank you in advance for your time and for your consideration of this project. Kindly please let me know if you require any further information or need any further clarifications.

Yours Sincerely,

HS Mathebula

Student's Name: Hubert Mathebula
Student's E-mail: mbhinyi.kuliki@gmail.com
Student's Address and Telephone: 810 Breet street, Pretoria 0184. Cell 0636876168
Supervisor's Title and Name: Dr Raimi Lukman
Supervisor's Position: Assistant Professor of Entrepreneurship
Supervisor's E-mail: r.lukman@unicaf.org

Hubert Mathebula

From:	Hubert Mathebula
Sent:	Monday, 16 December 2024 17:57
To:	munmanager@kareeberg.co.za; 'Faried Manuel'
Subject:	FW: Request for Assistance regarding data collection in Carnarvon for PhD Studies
Attachments:	GL_Hubert Request for Municipal Records.pdf

Dear Mr Manuel

I hope this email finds you well. You will remember that I wrote to you in January to request your assistance with my studies. After a long and excruciating period of data analysis and writing, I have completed my thesis and am now ready to submit it.

As a housekeeping requirement, it is required that I submit a signed gatekeeper letter as proof that I did obtain permission to access the record you provided to me. This letter was attached to the original email I sent to you to request your assistance in January.

May I kindly request that you sign and return the letter to me as I urgently require it to complete my submission. I hope I am not interrupting your festive break, but I would have waited until January if it wasn't urgent.

Kind regards

Hubert Mathebula
Deputy Director: Radio Astronomy
Department of Science and Technology
Cell: +2763 687 6168
Tel : +2712 843 6331
Fax : +2788 673 7881
Website: www.dst.gov.za
E-mail : Hubert.Mathebula@dst.gov.za



From: Hubert Mathebula
Sent: Wednesday, 17 January 2024 09:55
To: munmanager@kareeberg.co.za
Subject: Request for Assistance regarding data collection in Carnarvon for PhD Studies

Dear Mr Faried Manuel

I hope you had a wonderful December break, compliments for the new year.

I hope you remember me from the time you were the Municipal Manager at Kareerberg, I was driving the Carnarvon Science Visitor Centre project and also chair of the Northern Cape Working Group, I am happy to learn that you are back as the Municipal Manager at Kareerberg.

I am currently writing to you not as a DSI official but in my capacity as a PhD student at UNICAF University.

As part of my degree, I am carrying out a study on the "Role of the SKA in Building Sustainable Social Value in Carnarvon". This requires that I collect data using face-to-face interviews from selected households in Carnarvon. I'll be selecting my research participants using a purposive stratified random sampling technique. This technique requires that I have the following information about all the households in Carnarvon:

- The total number of households;
- Some form of identification (House number, stand number or street address)
- Telephone contacts of household heads (if available).

This information will be used to randomly select specific household heads who will be requested to participate in the study.

I therefore request your permission to access these records from the Municipality. The information accessed will be kept safe according to the ethics requirements of the University and no personal information will be recorded during the interviews.

I kindly request that you assist me with the relevant records.

If you require any further information about the study you can contact my supervisor, Dr Raimi Lukman at r.lukman@unicaf.org

Your assistance is highly appreciated.

Kind regards

Hubert Mathebula
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Department of Science and Technology
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Website: www.dst.gov.za
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